Chemical Age

East German Ethylene Contract Awarded to U.K.
(page 353)

VOL. 83 No. 2120

27 February 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

It's

"Metal Containers" Age

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Sir, why not ask NECKAR about de-ionisation?

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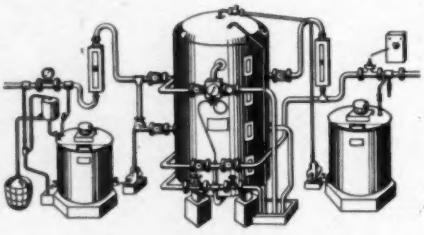

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ARTILLERY HOUSE, ARTILLERY ROW, LONDON, S.W.1

T R F STAINLESS STEEL PLANT and HOLLOWARE

We are manufacturers of a wide range of holloware in stainless steel which finds use, because of its resistance to many forms of chemical attack, in dye works, chemical factories, food factories, laboratories and, because of its inherent cleanliness, in hospitals.

We are also plant manufacturers in stainless steel, and welcome your enquiries for any stainless steel equipment. We fabricate vessels for light, medium and severe duty as laid down in BS. 1500.

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T.A. CHLORATE
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International NU-SWIFT News

No. 2

HAVE YOU MET THESE PEOPLE?

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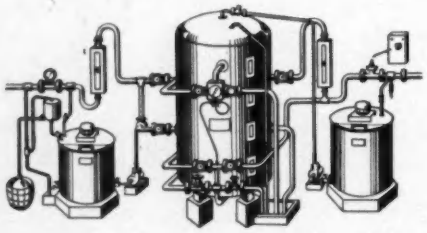

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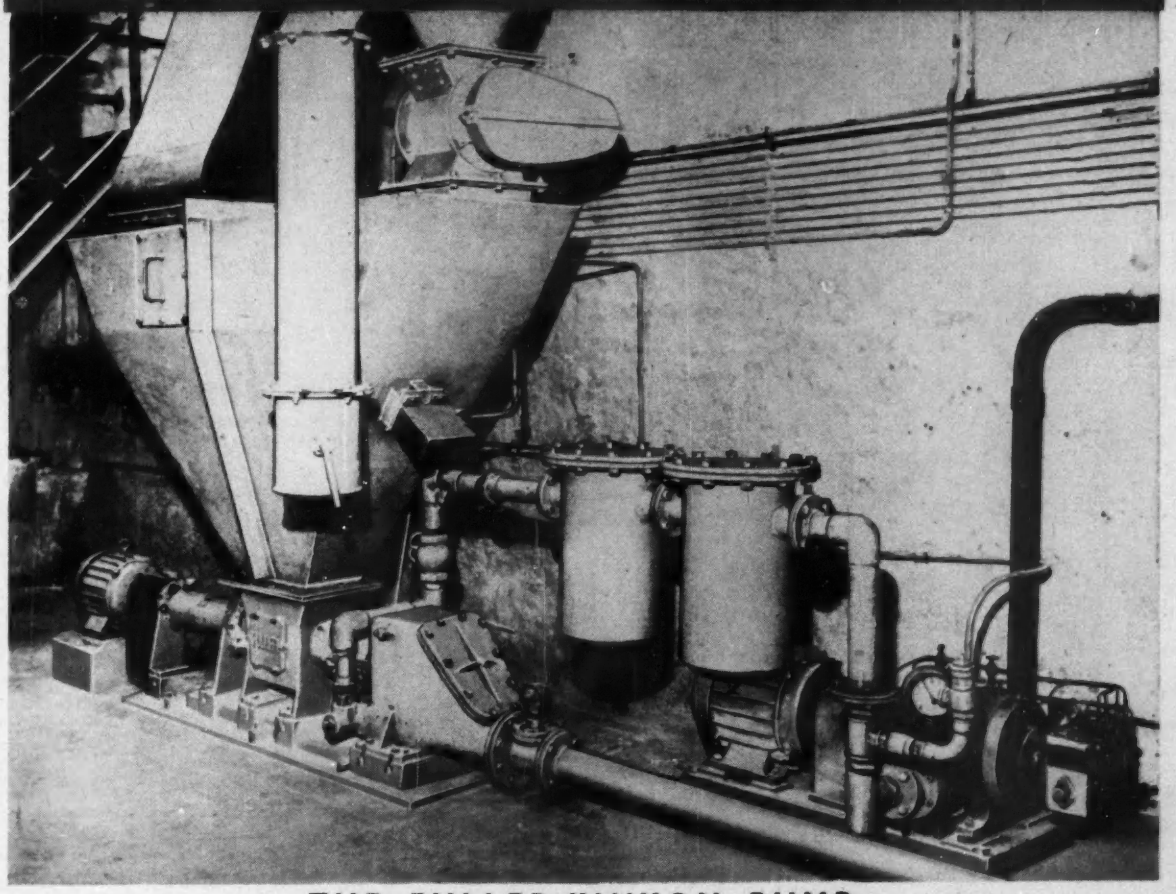

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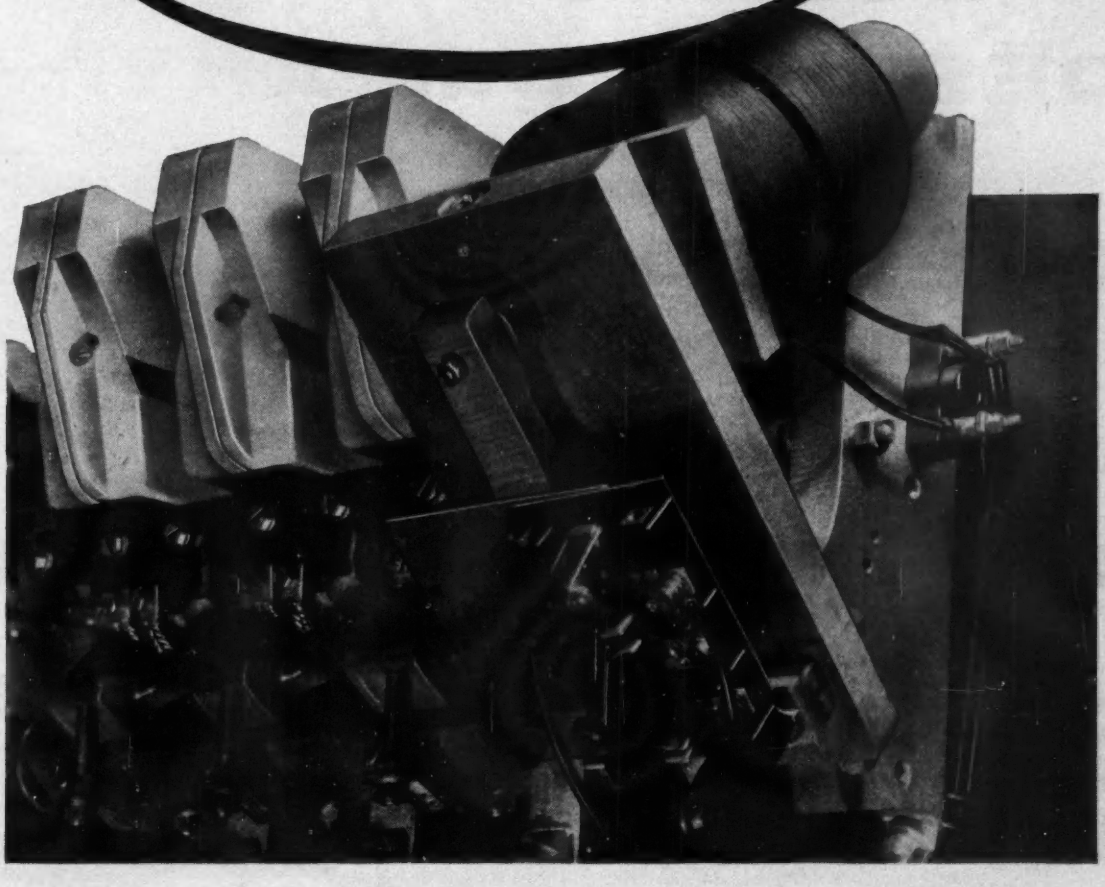

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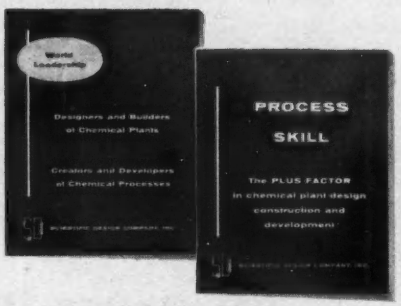

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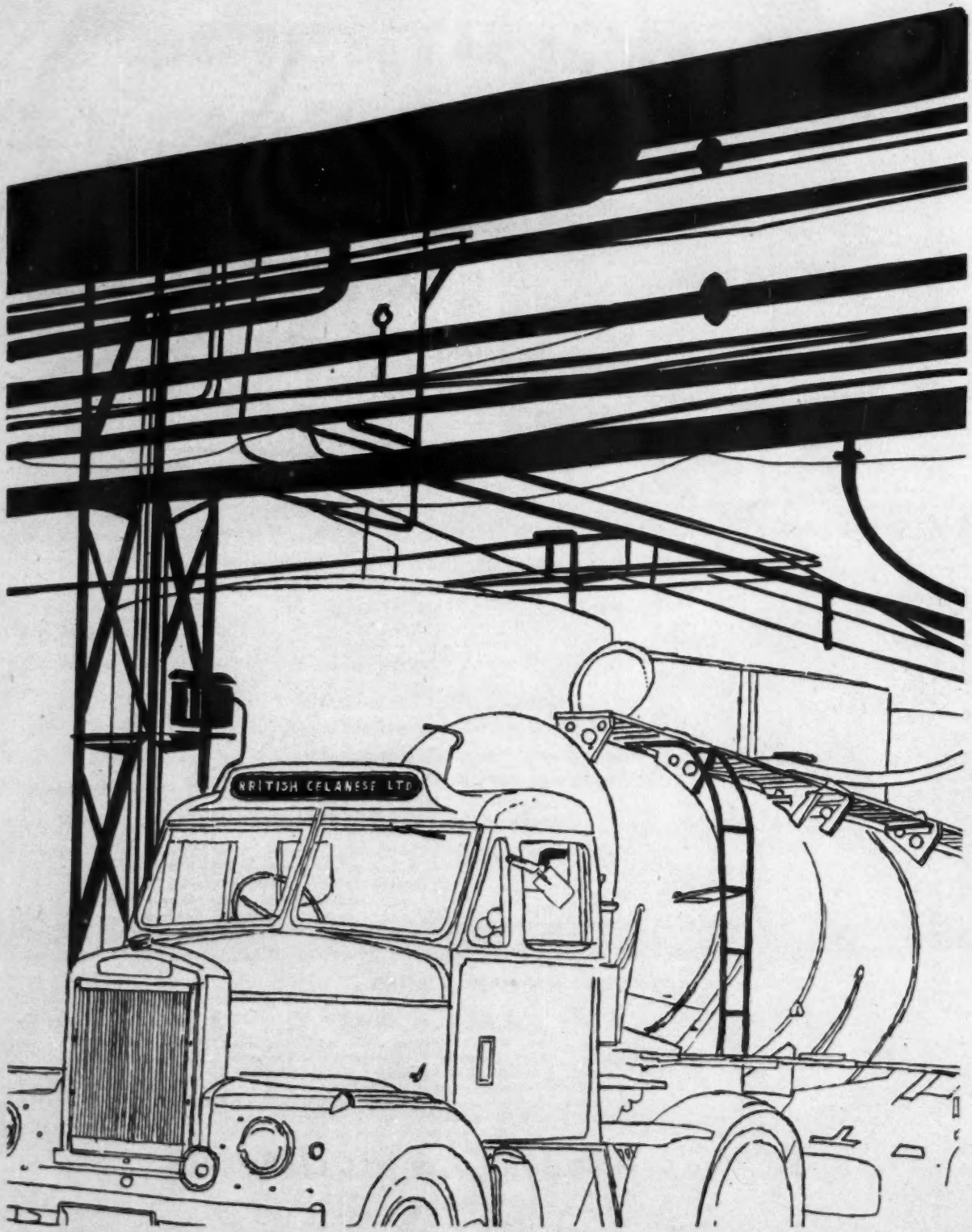

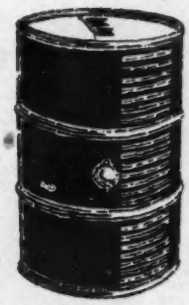

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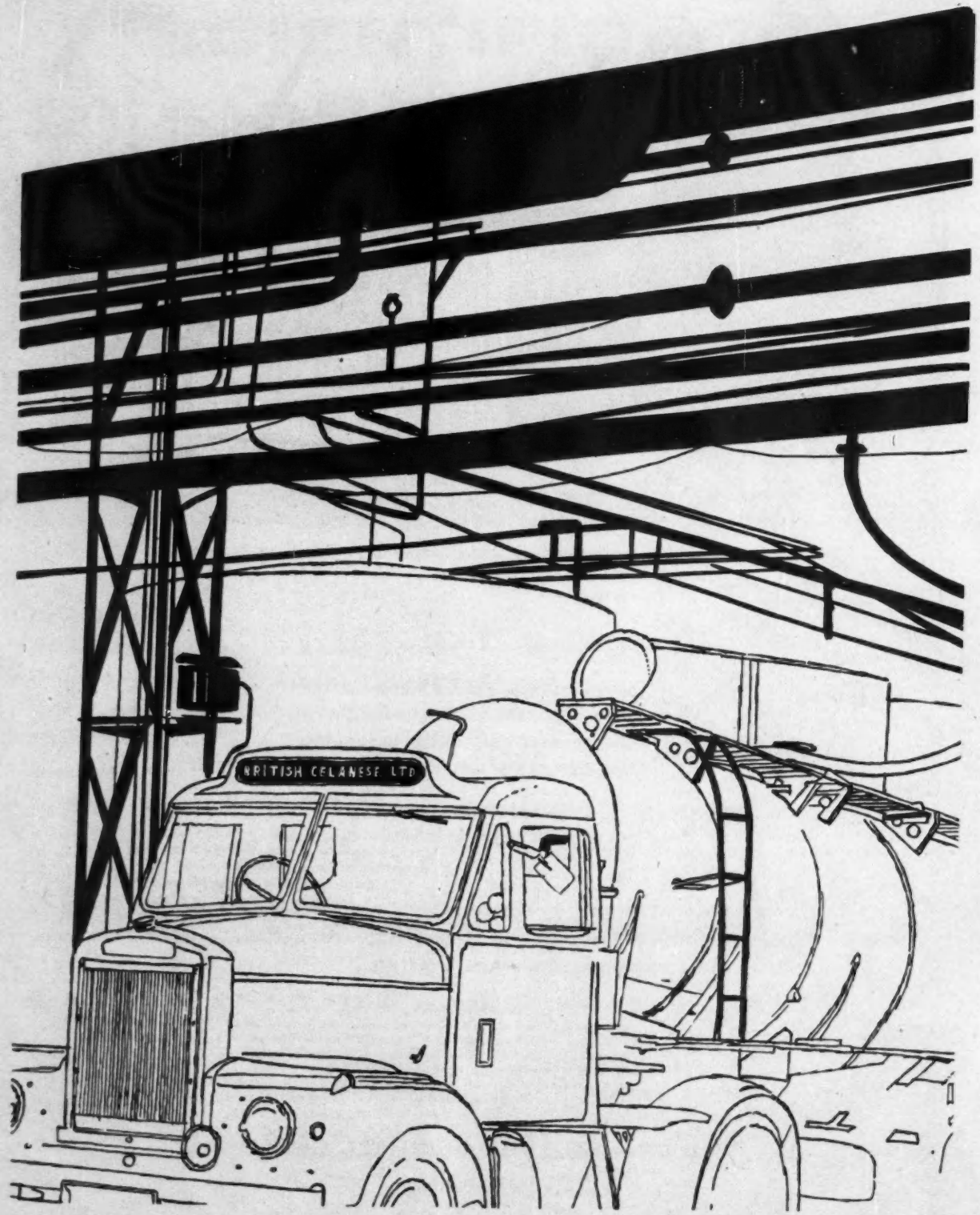

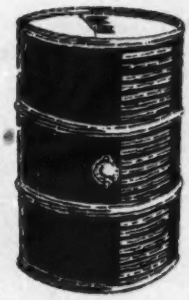

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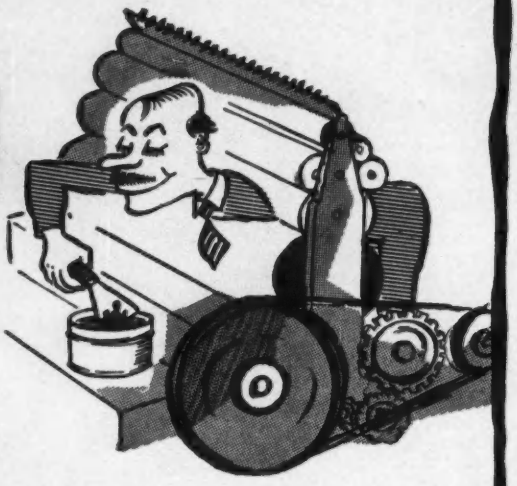

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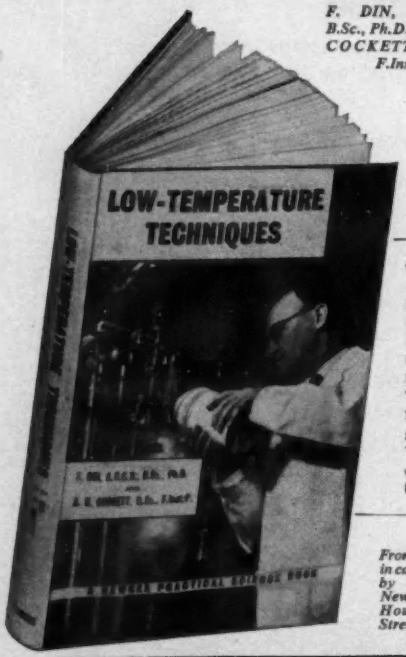

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GAS CHROMATOGRAPHY

DURING the last few years gas chromatography as an analytical technique has had a noteworthy influence on organic analysis. Introduced in 1952 by James and Martin, the technique has made rapid advances in development. All who are familiar with the technique consider it to be without equal by virtue of its elegance, simplicity and the rapidity with which results are obtained. Its other advantages are the need for only a small sample and the long life of the column.

Gas chromatography is already showing a widening field. From being a valuable analytical technique it is likely to become a means of producing high-purity chemicals. It is known that several laboratories have built their own gas chromatograph units with a view to commercial production of complex organic chemicals, while in the U.S. Beckman Instruments of California, Podbielniak of Chicago and Perkin-Elmer of Connecticut are now offering G.C. units 'tailored' for production purposes. Hormel Institute of the University of Minnesota says it will have available shortly small quantities of gas-chromatography-produced methyl eicosapentaencate, methyl docosahexaenate and methyl arachidonate, all of 99.99% purity. A Podbielniak unit with a 1 in. diameter column is used.

Costing about $10,000, Beckman's Megachrom is stated to be able to prepare 10 ml. of ultra high-purity iso-octane and ethyl alcohol in 30 minutes or 3 ml. of methyl oleate in the same time. By concentrated methods several hours and in some cases several days would be necessary. One Beckman unit is to be used to prepare pure chemicals for sale, and the company expect the Megachrom to be used extensively for obtaining high-purity fractions for analysis standards, chemical reactions and feeding experiments.

Montecatini have a Podbielniak unit (cost $15,000) with a 2-in. diameter column for separating low-cooling (20°C) hydrocarbons. This can handle more volume but is less selective than the thinner tubes. Several small-diameter columns can be used in parallel, however.

Podbielniak's design uses silicone grease or polyester succinate as carrier liquid, or liquid having a vapour pressure of 0.05 to 0.01 mm. of mercury. Perkin-Elmer's Model 154-D Vapour Fractometer ($3,000) is said to handle samples of several millilitres and to be able to separate 0.3 ml. for pure *trans*-dichloroethylene from 1 ml. of the isomeric mixture of *cis* and *trans* forms.

In the U.K., under development at W. G. Pye and Co. Ltd., Cambridge, is a whole range of chromatography equipment, including full-scale preparative units. Gas Chromatography Ltd. have a useful inexpensive instrument (£200 without recorder) which has interchangeable glass columns and employs a catharometer. The G.C.2 Beckman unit which is supplied in this country through Baird and Tatlock (London) Ltd. is now in wide use, and Petrochemicals Ltd., for instance, have six models of this instrument.

One field where gas chromatography might be expected to be quite widely used is in pharmaceutical analysis. It appears that except for the examination of solvents, volatile oils and perfumery materials the technique is little used. Indeed the *Pharmaceutical Journal* recently recorded (1960, **184**, 18)

that in over 700 references in a recent publication only about half a dozen references of pharmaceutical interest were included, yet the technique as gauged from recent investigations which have employed gas chromatography—tobacco alkaloids, hydrocarbons in smoke, analysis of alcohols and volatiles in biological materials—would be of outstanding value in the pharmaceutical field.

Latest development in gas chromatography is E. I. Du Pont de Nemours and Co.'s automatic large-scale unit, built by the company's Laboratory, Deepwater, New Jersey, chemists. This new unit is stated to separate litres of pure components from mixtures of gases, azeotropes or isomers. Automatically a sample of preselected volume is injected, eluted components are collected and the cycle is repeated.

Three major uses for this large-scale gas chromatograph are indicated: Preparation of pure compounds in fairly large amounts; isolation of sizeable quantities of minor constituents from a mixture; and accomplishment of difficult separations, such as from mixtures of azeotropes, isomers or compounds that polymerise at distillation temperatures.

This new chromatograph features a collector that removes each compound clearly as it comes from the column. To effect this the collector is coupled to a programme-controller and a recorder. The samples are then collected when the desired components register on the detector, as shown by the usual chromatogram. Temperature is thus not so critical and, according to Du Pont's Dr. Herman R. Felton, temperature equilibrium is not required even when a considerable mass is involved. The apparatus has in fact then operated above 200°C. and it is suggested that there would be no difficulty at 300° to 400°C.

Gaseous samples are pushed from a 'pressurising vessel' through a pre-heater into the packed horizontal column. Also liquid samples of 3 to 20 ml. can be vaporised in the pre-heater and pushed through by the carrier gas stream. Normally helium is used as carrier at about 30 p.s.i.g. At the column head pressure is about 6 to 12 p.s.i.g.

Pre-heater and column are 1 in. stainless steel tubes and the pre-heater is usually packed with uncoated, granulated firebrick. In the column the same packing is melted with a non-volatile partitioning agent, such as dioctyl phthalate. As the column length can be varied from 5 ft. straight tube to a 10 ft. U-tube or 20 ft. 'trombone' column, the unit is very versatile. The pre-heat coil is composed of 50 ft. of ¼ in. copper tubing.

As many as five fractions can be collected in a separation run and, depending on speed of separation, runs can be repeated automatically at intervals of 15, 30, 60 or 90 minutes. With 20 ml. as the maximum amount of starting material, the amount of any one compound that can be collected depends on the number of cycles that are run.

A new instrument that nearly doubles the scope of present gas chromatographic analysis is a 500°C. linear-programmed temperature gas chromatograph developed by F. and M. Scientific Co., Wilmington, Delaware, U.S.

It is reported: to resolve complex organic mixtures of low, medium, and high-boiling materials—components with from 1 to 75 and possibly even 100 carbon atoms—all in one run; and to handle complex mixtures of inorganic and organic gases, organics in water, and high-boiling materials such as glycerides found in butter and other natural products. In addition the new unit has nine linear heating rates to speed up or slow down analysis time and so provide the necessary component separation.

Temperature limitations are overcome in the new model, No. 500, by use of a high-temperature tungsten filament detector that increases the range to better than 500°C (as fast as 48°C a minute with no temperature overshoot this company claims). Another problem of concern to gas chromatography operators is the limited number of column packings available that can operate at up to 500°C. F. and M. Scientific use a highly-conditioned silicone gum rubber in model 500 and have also tried irradiated asphaltenes, other petroleum residues and inorganic salts. It is understood that a number of U.S. research establishments are now investigating new, improved high temperature packings that could increase the operating range of the gas chromatograph still further. Cooling rate of the present unit is 50°C. a minute—in just six minutes the operator can replace a column and establish base-line stability. Cost of the new instrument is about $2,500 with a recorder.

PERARYLATED SILANES

PRODUCTION of many new materials from perarylated silanes—the new organic system remarkable for its size, versatility, and radiation and heat stability—is predicted.

Perarylated silanes comprise a class of molecules which contains literally hundreds of thousands—perhaps millions—of members constructed by combining silicon atoms and aromatic groups into various molecular arrangements.

Work on this new organic system has been done by U.S. Air Force chemists L. Spralter and C. W. Harris, Wright Air Development Centre, U.S. Air Force. In their report, recently released (PB. 151860) through the Office of Technical Services, U.S. Department of Commerce, these investigators note that some types have shown unusually high resistance to radiation, oxidation and high temperature (to 600°C). Their versatility, it is considered, may lead to use in lubricants, hydraulic fluids, insulators or dielectric materials, and radiation-detection materials. Particularly promising is the possible production of new stable elastomers and plastics from polysilarylene polymers. Chemical derivatives of these types could lead to new adhesives and synthetic fibres, it is suggested.

Spralter and Harris call for stepped-up, developmental efforts in such areas as the preparation of new molecular species, polymers in particular. New chemical derivatives, they say, are needed to "engineer around" short-comings of molecules now available. The views of these research workers are based on studies of the synthesis and selected physical properties of various structural sub-groups in the general class of perarylated silanes. These include the phenyl-4-biphenylylmonosilanes, the phenyl-2-thienylmonosilanes and selected silarylenes.

SULPHUR FROM SO_3

CONFIDENT that they have a suitably balanced situation and the technology to show a profit, Texas Gulf Sulphur and International Nickel are contemplating production of sulphur from sulphur trioxide. (*Chem. Engng.*, 1960, **67**, No. 3, 60.)

In the process,, sulphur dioxide in roaster gas is reduced with natural gas, propane or fuel oil at "moderately" high temperatures over a special, as yet unidentified, catalyst. Results from a £500,000 joint pilot plant at Inco's smelter at Copper Cliff, Ontario, Canada, after eight months of operation are stated to be encouraging.

Several important economic factors are associated with this process for Texas Gulf and Inco. These producers are near to the Great Lakes sulphur market so it may prove possible to bring Copper Cliff sulphur to Chicago at a price that is competitive with brimstone. Difficulty of marketing locally all smelter sulphur as liquid sulphur dioxide and sulphuric acid is another reason. It is thought that it may be better economically to store sulphur on site temporarily for immediate use than to ship SO_2 and sulphuric acid large distances to find markets.

Finally a partner in Texas Gulf whose business is sulphur. Metal producers with proposed sulphur-from-sulphur dioxides schemes have in the past found the marketing of sulphur unfamiliar and unwanted.

Project News

U.K. Firms Win £4 m. Ethylene Contract for East Germany

WORK is to start at once on a 40,000 tons-a-year ethylene plant for East Germany by Humphreys and Glasgow Ltd., 1 Carlisle Place, London S.W.1, who won the contract in association with Petrocarbon Developments Ltd. Contract for the design and detailed engineering of the first phase—a cracking unit—was signed in London in January by representatives of the East German foreign trade enterprise Dia-Chemieausrüstungen and the U.K. companies. The first phase is due for completion in December 1962 at a cost of about £1.5 million; the completed plant will cost about £4 million.

This is the first time that British chemical engineering concerns have provided both know-how and design for a plant of this type outside the U.K. It is also the first time that U.K. companies have obtained a contract for a complete chemical plant for East Germany, whose chemical industry ranks second, among Eastern countries, to that of Russia. The contract is part of the East German industry's expansion programme and is one of the first results of the recently-signed 1960 amendment to the 1959 trade agreement between the Federation of British Industries and East Germany, which envisages exchanges worth £7 million each way in 1960. (See also 'Distillates', p. 354.)

● An order for 13 air coolers and condensers for the new Turkish oil refinery at Mersin has been awarded to Daniel Adamson and Co., Dukinfield, Ches.

● Drum-making plant worth about £22,000, has been supplied by Moon Brothers, Ltd., Birkenhead, to Mettur Chemicals and Industrial Corporation, India. It is being installed at Mettur Dam to make 280 mm., 355 mm. and 500 mm. drums for chemicals. The plant is capable of turning out 900 drums a day.

● Woodall-Duckham Construction Co. have received an order from the Sierra Leone Development Co. to build an ore preparation plant at Marampa valued at more than £300,000. The plant will be capable of dealing with 110 tons of crude iron ore an hour.

● CONSTRUCTION work on the new £500,000 Cardiff terminal of Regent Oil is to start immediately and is in the hands of two contractors. Whessoe Ltd., Darlington, will supply and erect tankage while the main contract for all other features of construction has been placed with Constructors John Brown, London W.2. The project is scheduled for completion by the end of 1960.

Need for Rapid Expansion Led I.C.I. to Use Esso Ethylene

BEHIND I.C.I's Severnside development announced last week ('Chemical Age', 20 February, p. 317) is, according to the company, the "marriage of two opportune factors"—first, the helpful assistance of Esso Petroleum in contracting to supply ethylene at the rate of 40,000 tons a year and, second, the "sanguine view" which I.C.I. are able to take of existing and future market trends for olefins and olefin derivatives, both inside and outside the company.

Initially 35,000 tons a year of ethylene oxide, ethylene glycol and associated products will be made. Currently I.C.I.'s ethylene production is at a rate of 110,000 tons a year and this is being increased during 1960, with modest capital expenditure by not less than 20%.

The new phase of manufacture destined for Severnside is considered by the company to be an interesting example of the flexibility of I.C.I.'s tonnage organic chemical operations and of the position of an independent chemical company in the petrochemicals field.

I.C.I. say that although the Severnside project suggests a departure from the company's present naphtha-pyrolysis method of producing ethylene, this departure is in fact "brought about and dictated by the need to extend manufacture as rapidly as possible under the favourable conditions now obtaining". The company says that it has been anxious to develop the Severnside site quickly. It was seen, so far as petrochemicals were concerned, that while an integrated scheme of the Wilton type was not called for at present. A "most important opportunity of broadening the base of petrochemical operations was ready to be grasped, providing the right source of ethylene was available".

Ethylene at Severnside

In their statement I.C.I. indicate that when the demand for other olefins is established at Severnside and when the ethylene offtake is great enough to support a large modern olefin plant, they are likely to return to the manufacture of further quantities of ethylene by naphtha-pyrolysis at Severnside. In the meantime, the new works, by rapidly expanding ethylene utilisation and indirectly promoting much intensified propylene utilisation, will be no more than a logical extension of ideas conceived during the war and put into practice with the start-up of No. 1 olefin plant at Wilton Works in 1957.

At Severnside, I.C.I. will be the first company in Britain to operate the Scientific Design Co.'s process involving direct air oxidation of ethylene to ethylene oxide, although similar plants have commenced operations at a number of centres outside Britain in recent years. The ethylene glycol plant, and plants for associated products will be designed by I.C.I. The direct air oxidation process chosen differs from the alternative oxidation process in that air and not pure oxygen is used, and from the chlorhydrin process—already well established at Wilton—in that chlorine is not employed. The Scientific Design process was selected after full consideration of the three processes, when it was decided that this fitted the local circumstances best.

Olefin utilisation by Heavy Organic Chemicals Division—now to be at the three manufacturing centres of Wilton, Billingham and Severnside—more than ever forms the core of its interlocking operations. Ethylene still by far the largest-tonnage olefin, has its main market in 'Alkathene', although as an ethylene user, ethylene oxide is rapidly growing. 'Terylene', explosives and anti-freeze, among other industrial products—as consumers of ethylene glycol—all continue to enlarge their claim on ethylene oxide capacity.

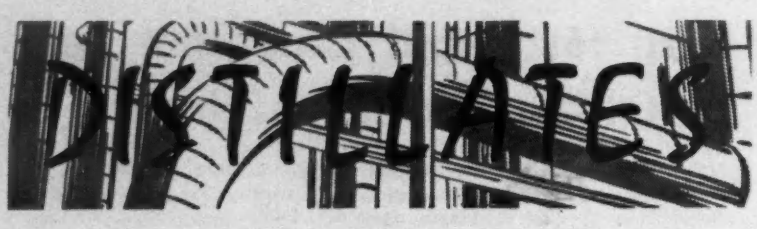
Present propylene capacity is 80,000 tons a year and growing rapidly. 'Propathene' is expected to make increasing demands on capacity from mid-1960 onwards. Propylene glycol and propylene oxide, manufactured at Wilton by the chlorhydrin route, are already making important contributions, mainly in the spheres of polyurethane foams and polyester resin manufacture (notably for such purposes as laminated car and boat bodies). These C_3 derivatives are available to industry at large.

Wilton capacity for both propylene and C_4 hydrocarbons—including 14,000 tons a year of butadiene—will be increased, together with the output of associated plants utilising the olefins—some of these being at Billingham Works.

Butanols Expansion

Recent expansion of normal and isobutanols capacity, I.C.I. state, will develop propylene utilisation still further in 1961. As regards butylation, plants will shortly be brought on stream for the production of Topanol refined grades of butylated hydroxytoluene antioxidants. This extends I.C.I. interests in antioxidants into agriculture and human foods, and underlines the company's position in this specialised field of applied chemistry. In the field of carbonylation, where I.C.I. benefits immediately from such a high level of plastics activity as now exists, further extensions are being installed which will consolidate the company's position as the world's largest manufacturer of plasticiser alcohols.

The years 1960 and 1961 promise to be a period of intense sales growth for I.C.I.'s tonnage organic chemical interests—despite competition in many world markets. The plans for Severnside will broaden the base and extend the range of the I.C.I. petrochemical enterprise now at the start of its second decade.



★ A NOTABLE milestone for British chemical engineering is marked by the contract for an ethylene plant to be built in East Germany, which has been won by Humphreys and Glasgow in association with Petrocarbon Developments. Not only is this the first time that British companies have provided both know-how and design for a plant of this type outside the U.K., it is also the first time that East Germany has placed a contract in Britain for a complete chemical plant.

Although the two companies are not responsible for procurement, handling only design and know-how, it is probable that much of the plant and equipment will be purchased in the U.K., for it is unlikely that the East German engineering industry is sufficiently developed to supply it.

I understand that the petroleum feed for the 40,000-tons-a-year ethylene plant will come by pipeline from Soviet oilfields. Since East Germany is one of the four East European countries that discussed the purchase of polythene know-how with Mr. S. P. Chambers, I.C.I.'s chairman-designate, on his recent visit to Warsaw, it seems likely that the next East German-U.K. contracts will be for polythene and ethylene oxide.

★ THREE comments on the Monopolies Commission report on fertilisers that I think worth recording are those of Mr. H. H. Blandford, director of Ulvir Ltd., Boreham Wood, and Mr. R. Lamb of Salisbury, writing in *The Times* last week, and Mr. G. B. Drayson, Tory M.P. for Skipton.

Mr. Blandford said the report did not show the unhappy position that would arise when the manufacturing and distributing trade of Britain would be entirely dominated by a few big concerns, having swallowed up most of the small ones. As one of the small fertiliser producers in a market dominated by the big companies, he sees that we shall end up paradoxically in a similar position to Russia, where a few large State enterprises control the destinies and needs of the public. We would have groups of companies controlled by the board and owned by shareholders which were as anonymous as the Russian State?

Mr. Lamb writes of the heavily protected U.K. nitrogen market, with demand stimulated by a subsidy of nearly 50%. In spite of the Commission's report, he says that many will feel the price paid by farmers should bear some relation to the export price and not be calculated entirely on I.C.I.'s costs. In the U.S., nitrogen producers have to accept the same low price for both domestic and export sales and Mr. Lamb is surprised that the Commission did not even examine whether that would be in the public interest in Britain.

Mr. Drayson, who in 1953 persuaded the East German Government to make potash sales direct to the British company with whose chairman he has 'a business association,' estimates that during the past four years the price reductions for bulk supplies have saved fertiliser makers 10% on their raw material costs for potash.

★ AT A conference held last week in London by the Council for Nature, on the effects of chemical sprays on plants and animal life there was general appreciation at the enlightened attitude adopted by manufacturers. The conference was attended by more than 40 delegates representing 24 different organisations, including agriculture, forestry, natural history, producers of insecticides and herbicides, angling, bee-keeping and game preservation.

It was recognised that all land under cultivation was bound to be raised to a maximum productivity of food with the aid of chemical sprays, but concern was expressed at the often unintended effects on wild life, particularly in the use of herbicides to clear vegitation from waterways.

Above all else was the need for more research into the effect on wild life, especially beneficial insects, of the increasing use of toxic sprays. I understand that long-term research into these problems is planned by the Nature Conservancy.

★ THE first low temperature plant used by British Oxygen to obtain oxygen from the atmosphere by a process of liquefaction and distillation had an output of 50 cu. ft. of oxygen an hour. Today as much as 200,000 cu. ft. an hour —or 200 tons a day—is produced by a single plant.

Some industrial processes call for huge quantities of oxygen in a relatively short period and the most economical way of meeting these peak demands is by using storage tanks in combination with a tonnage plant. The Chemical Plant Division of British Oxygen Engineering, which has its headquarters at Edmonton, in north London, has developed storage tanks which hold the equivalent of 15 million cu. ft. of gaseous oxygen. In liquid form, this vast quantity of gas occupies only 18,000 cu. ft.—about 0.12% of its gaseous bulk and weighs 565 tons.

I learn from the latest issue of *Pennant*, the B. O. Group newspaper that the Chemical Plant Division now has site engineers working in India and South Africa and in the U.K. from Dounreay in the north to Crawley in Sussex and Margam in Wales. The Division is currently working on the Lurgi contract for the Scottish Gas Board, while at the Middlesbrough plant, manufactured and erected by B.O.E. nitrogen of exceptionally high purity is supplied to the I.C.I. Wilton works.

★ LONG concerned at the total lack of simple dimensional standards for centrifugal pumps, the Engineering Equipment Users' Association, has made an extensive study of the subject and has produced two simple draft standards for end-suction and horizontally split-casing pumps. These drafts only deal with overall fixing dimensions and the aim is to ensure that all makes can be readily interchanged.

The lack of dimensional standards for centrifugal pumps, despite their wide usage, has led to difficulties when completing new plants or the replacement of individual units, for fixing and other leading external dimensions of pumps for similar or identical duties differ with every make. It is also possible that piping plans could be delayed while awaiting dimensional details of new pumps.

The new proposals are supported by some of the largest U.K. industrial firms; other users as well as pump makers are being urged to collaborate through the medium of the British Standards Institution to prepare suitable specifications.

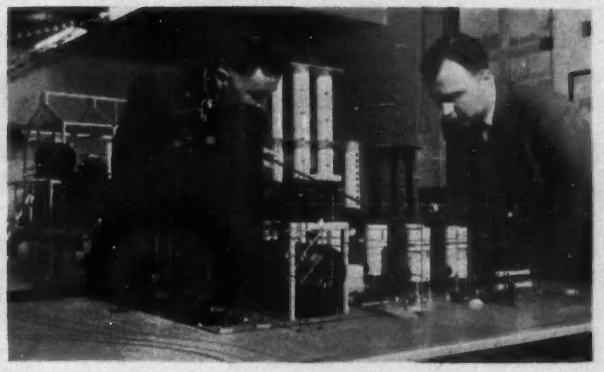
★ REFERRING to the Tariff Board hearings on chemicals, which opens in Ottawa on 22 May, Mr. P. C. Allen, president of Canadian Industries Ltd., recently told the Montreal Section of the Chemical Institute of Canada that while higher tariff rates on organic chemicals and plastics would help, a lasting solution to the problems facing the industry depends on sound investment decisions. Excessive competition from Canadian and overseas sources was responsible for the industry's decline.

The rate of market growth must be related to the population and at present there were just not enough Canadians to support several competing plants all across the country. Mr. Allen was convinced that the industry must operate within the confines of its own distinctive and limited market settings and not be considered as a copy in miniature of the U.S. chemical industry.

The tariff board hearing on 22 May will deal only with the presentation of general information about the chemical industry and of views on the rate structure and tariff terminology. Further hearings, likely to be held in September, will deal with representations on rates of duty applied to particular items or groups of items.

Alembic

MODELS AID WHESSOE AND S.E.G.B. DESIGN OF NEW TAR OILS PLANT



Whessoe themselves fabricated this model of the tar oils plant ordered by South Eastern G.B.

THE tar oils plant to be erected for South Eastern Gas Board by Whessoe Ltd., Darlington, which has a designed output of 15,000 gall./day of light oils and 18,000 gall./day of naphthalene oils, is scheduled for completion towards the end of 1960, and will be situated at Ordnance Wharf, East Greenwich. Whessoe are also handling engineering design and procurement, while basic design for the continuous plant for the extraction of tar acids and bases was by Mr. R. F. Twist, M.Sc., A.M.I.Chem.E., manager, S.E.G.B., Ordnance Wharf Works, and Mr. D. B. McKean, B.Sc., A.R.I.C., A.M.I.Chem.E., chemical engineer of S.E.G.B., in conjunction with Whessoe.

Design of the plant has been greatly assisted by modelling techniques, whose advantages over conventional drawing methods are rapidly gaining popularity. A small scale model was used to obtain quick decisions on layout and spacing and details of units and buildings were worked out on a large scale 'piping model' (illustrated).

The tar acids are extracted from the tar oils with 8-10% caustic soda solution, and then freed from the carbolate or cresylate solution by reacting with gases containing CO_2 which regenerates the phenols and leaves sodium carbonate in solution (i.e. 'springing'). Tar bases, pyridine, etc., are extracted with 20% sulphuric acid and the bases freed with an alkali, soda or ammonia.

Five Fractions

The plant under construction will handle a benzole fraction, a naphtha fraction, and three creosote fractions, products of continuous tar stills. All fractions are washed for tar acids but only the first two are washed for bases, as the market does not warrant recovery of higher bases.

The extraction step is being carried out in a series of counter-current mixer/separator stages, the mixing being performed by a centrifugal pump circulating through a small vessel with the throughput passing to a separator.

The extracted tar acids in soda solution are purified by a benzole wash and steam distillation and passed to three carbonating (springing) towers in series. The tar acids are separated for sale and the carbonate solution for recycling.

The bases are extracted in similar mixer separators, 'sprung' in a further vessel with 20% ammonia solution and dried for sale, while the ammonium sulphate solution formed is sent for fertiliser preparation.

For maximum economy, the soda solution is causticised and recycled in the circuit. The process using burnt lime is carried out with maximum use of mechanical handling of lime and spent carbonate cake. Convenience and cleanliness have also been considered in the design, which bears little resemblance to the older causticiser plants.

The incoming burnt lime is received in rail containers and stored in a lime hopper from which batches are transferred to the causticiser. The reacted batch is filtered free of calcium carbonate on a rotary vacuum filter. The process follows the normal course of causticising, with the emphasis on lime quality, temperature and time to produce an easily filtered slurry.

All storage tanks for reagents and products are provided in two areas in the site, the oils being passed through the plant and away to product tanks for further refining or distillation to pure products. Owing to restricted site area, plant design has entailed careful positioning of a large number of units and pumps, and consideration has been given to flameproof regulations, accessibility, design of pipe runs, instrumentation and electric cabling.

The plant, being constructed to a tight schedule, will enable the Gas Board to produce products to exacting specifications.

Heat-conducting Cement for Materials With High Freezing Points

A NEW heat-conducting cement, Kondcut, believed to be the first product of its kind to be manufactured in the U.K., has been introduced by John L. Lord and Son, chemical engineers and contractors, Wellington Cement Works, Bury, Lancs. This non-metallic plastics compound on setting has a very high thermal conductivity, 100 B.t.u./(hr.)(sq. ft.)(°F)/in., and is used to increase the heat transfer contact area between steam tracing or electric heating systems and the item to be heated.

It was developed specifically for those systems used for the transfer and storage of materials that have high freezing points or become highly viscous at atmospheric temperatures, such as sulphur, still residues, phenol, tars, phthalic and maleic anhydrides, high viscosity fuel oils, etc.

This cement can be used in almost all systems where jacketing arrangements are normally necessary and in many cases where it has not been possible to fit jacketing or conventional tracing. In all cases a considerable saving in cost is claimed. Although developed for heating duty, the cement operates equally efficiently for cooling systems.

Heat-conducting cement can be used satisfactorily at temperatures from sub-zero to a maximum of 750°F provided the recommended curing procedure is followed. It may be stored between 40°-100°F in closed containers indefinitely.

Moistening the surface during application facilitates initial bonding. The cement can be used in contact with all normal pipe materials, but special care must be taken when applying it to aluminium. During curing the cement must not be allowed to get wet as at that stage it would readily absorb water. As soon as curing is completed the surface should be insulated in the normal manner.

When using the cement in pipe tracing it is not necessary to wrap the pipe with tracing to obtain efficient heating, the tracing should be run parallel and adjacent to the line. The amount of cement necessary is as follows: tracer size, ½ in., 0.15 lb./ft., ¾ in., 0.25 lb./ft.; 1 in., 0.35 lb./ft.; 1½ in., 0.75 lb./ft.

On horizontal vessels, the tubing or pipe tracing should be laid horizontally along the tank and bonded in position at 2-4 ft. centres. The coils should be concentrated at the lower portion of the vessel, but some may be necessary on the upper portion to prevent solid condensation around nozzles, etc. As the shear strength of the cement is quite high compared to tensile strength, the tracer layout should be made so that any expansion stress will work against the shear strength rather than the tensile strength of the cement.

Prices range from 2s 3d per lb. ex works for 100 lb. or less to 2s per lb. for 1,000 lb. and over. A leaflet on properties, application and suggested uses is available.

Future of Petrochemicals - L. H. Williams at S.C.I. Meeting

THOSE chemical products which were produced from petroleum could be made equally well from other products such as, for instance, coal. The reason for the use of petroleum for the production of chemicals was largely economic, so stated Mr. L. H. Williams, managing director, Shell Chemical Co. Ltd., when he gave the Fifth Ivan Levinstein Memorial Lecture in Manchester on 5 February. His lecture was entitled 'The future of chemicals from petroleum'.

"The future of the product made from petroleum will depend on cost and price suitability and end use," observed Mr. Williams. Taking into account nuclear power development in the future, and making all due allowance, it might reasonably be concluded that for many years to come a chemical industry based on petroleum could be expected to expand, given adequate availability.

Since the end of the Second World War petroleum hydrocarbons had been readily available and at relatively stable cost. The economic process stimulated a great advance in technology. "What then, is the future for this industry?" Mr. Williams asked, an industry which in 40 years had grown from zero to 76% of organic chemicals production in the U.S. and probably about 50% of world organic chemical production.

Atomic energy had come to stay, declared Mr. Williams, and by the end of this century would probably have developed into a major source of world energy. Demand would be much greater than at the present for products such as plastics, fibres, detergents, drugs and insecticides. There would be a steady improvement in quality. A great interest would be shown in the use of free radicals. The space age would call for the development of complex chemicals. The world of the future was going to need more highly specialised fluids in large quantities.

Discussing the development of high polymers, Mr. Williams suggested that control of the shape of polymer molecules could be expected as well as developments in applied technology. One great disadvantage until now had been the power of resistance to heat of plastics materials. In the future they could expect plastics to resist temperatures of 400 to 500°C for extended periods. Other advances in production could be anticipated, particularly in inorganic polymers.

Advances, too, could be expected in fibre production and here the field of the polypropylenes seemed to offer great possibilities. Potentialities of the polyurethanes were by no means exhausted.

After discussing adhesives, Mr. Williams dealt at some length with detergents. There was a large potential market in the undeveloped countries, but the synthetic detergent which could replace soap had not been achieved. This would represent a primarily chemical discovery and a major advance in technology. Work on this type of product was being carried out in all the major industrial countries of the world and a solution might be expected within the next few years.

The use of solvents for the extrusion of metals would grow and another field which would develop was the use of chemical intermediates. Acrylonitrile chemistry, too, should expand considerably.

Chemicals from the petroleum industry could be expected to play a large part in food production in two ways: 1, Production of fertilisers and insecticides; 2, Direct synthesis of actual chemicals, and the production of synthetic fats, for instance, should not be too difficult.

Acid Tanks in Cobex Rigid P.V.C.

Containing concentrated nitric acid, mixed nitric and hydrofluoric acids heated with Carbinert immersion heaters, and concentrated hydrochloric acid, these tanks at 'a Government research station' are made from Cobex rigid p.v.c. reinforced with glass-fibre. The equipment was designed and manufactured by Turner and Brown Ltd., Davenport Works. Bolton, Lancs.

Croda's One-day Manchester Exhibition

ON show at an exhibition held in Manchester on 19 February, and organised by the Croda Organisation Ltd., Croda House, Snaith, Goole, Yorks, were exhibits from Croda Ltd., lanolin, rust preventatives, etc., and the associated companies, C. M. Keyworth and Co. Ltd., emulsifying agents, Ultrasonics Ltd., and St. Tydfils Packaging Ltd.

New developments in chemicals were shown, together with two recently introduced items of laboratory equipment by

F.A.S. Wood, managing director, Croda Organisation Ltd., shows the new Minisonic pilot plant ultrasonic homogeniser which will sell at about £140

Ultrasonics, the Minisonic pilot plant ultrasonic homogeniser (illustrated) and the new Rapiclean laboratory-scale ultrasonic cleaning device.

The Minisonic has three uses. The first, as a laboratory homogeniser, permits emulsions and organic dispersions in quantities up to 3 litres without premixing from one filling. The second, as a small batch homogeniser, allows homogenisation of small production batches in a few minutes. The third use, as a pilot plant homogeniser, enables an emulsification or homogenisation process to be worked out on a small scale, exact reproduction on a larger scale being possible with the Rapisonic production homogeniser.

A.B.M.A.C. to Admit Overseas Farm Chemical Producers

Rules of the Association of British Manufacturers of Agricultural Chemicals, Cecil Chambers, 86 Strand, London W.C.2, have been revised to create a new class of associate membership to firms which manufacture crop protection chemicals overseas and sell them on a substantial scale in the U.K. Both the new category and the existing category of full membership will receive a similar service, but associate members will not be able to vote or hold office.

Phenol Hearing

WHEN I.C.I. LEFT THE P.P.A. AND CUT THEIR PRICES

CONTINUING his evidence on behalf of the Phenol Producers' Association at the Restrictive Practices Court (see CHEMICAL AGE, 20 February, p. 322) Mr. J. B. Vickers, chairman and joint managing director of Yorkshire Tar Distillers, said that a fixed price for phenol gave stability to the market.

Presenting figures of losses that would occur if manufacturers did not sell the phenol produced, Mr. Vickers stated that assuming the present price was £150 a ton, then if phenol, after manufacture, was put into fuel for burning the loss of revenue would be £140 a ton. To his company that loss would approximate to £250,000, representing about 66% of their total income.

Mr. Vickers willingly admitted that this material would not be put out as fuel if it could be sold at more than £10 a ton. Tar distillers, however, could not afford to scrap the production of phenol.

Replying to a question by Mr. T. G. Roche, Q.C. (for the Registrar of Restrictive Trading Agreements), Mr. Vickers said that the ultimate residue, after the chemical materials had been removed from the tar, was pitch.

Mr. Roche asked if pitch could be used for making road and was informed that it could be used for that purpose. Mr. Roche then asked if there was not a good demand for road tar at the moment and that with the road programme as at present envisaged, this demand was likely to remain good. Mr. Vickers reported "We hope so".

Decisive Factor

It was suggested by Mr. Roche that the decisive factor in deciding whether or not to reduce the price would be to keep the price of phenol as high as possible; but if it was kept so high that phenol could be imported at a lower price it would be fatal. To this Mr. Vickers replied that as businessmen they should not do that.

Mr. Roche: "So that really has been the decisive factor throughout—to keep the price of phenol as high as possible, provided that people could not buy on the world market and pay 33⅓% duty and still get it cheaper?"

Mr. Vickers: "No." He agreed that the bulk of phenol available on the world market was synthetic. It was the policy of the producers in the Phenol Association, he said, to regard it as their first duty to provide raw material for the home market. Transport costs were not considered in fixing prices.

Mr. Roche: "That can only be because you fix your price so high that there is ample margin for such contingencies?"

Mr. Vickers: "No, I do not agree with that. We fix our prices so as to enable our customers to compete."

On being re-examined by Mr. B. J. M. MacKenna, Q.C. (for the Phenol Producers' Association), Mr. Vickers stated that the gas industry only disposed of its crude coal tar through co-operative distilling arrangements and the return to the industry depended on the price at which the products were sold by the distiller.

In the fourth day of the phenol hearing the court heard Mr. Vickers report that during 1959 his company had produced and sent out more than twice the amount of phenol than ever before.

Mr. Roche said he was grateful for the statement that Yorkshire Tar Distillers had a larger sale last year than ever before. "It is the Registrar's case that your industry is exceptionally prosperous."

Output of Phenol

Mr. Vickers informed the court that within the limits of stocking facilities, it was possible for a company to adjust its phenol production year by year. It was also possible to vary the output of finished phenol, but it was not possible to control the amount of phenol extracted. The price of their coal tar was related to the competition they had. Similarly the price of creosote-pitch mixture was controlled by the selling price of heavy fuel. There was no world price for pitch, the main overseas markets for which were France and Spain.

An article by Dr. D. McNeil, director, Coal Tar Research Association, in the *Financial Times* Chemical Supplement last December, was referred to by Mr. Mackenna (for the Association) when he questioned Mr. Vickers. In reply, Mr. Vickers said that the statement in the article that there had always been a certain unbalance between the capacity of the industry to provide chemicals and the demand of the chemical industry for them was perfectly true.

Companies getting a poor return from their products would be the ones most likely to move out of the distilling business, and Mr. Vickers said he thought there would be a rapid move in that direction if there was a large fall in the price of phenol.

Replying to a further question, Mr. Vickers said his company had sold in 1958, 119,000 tons of creosote-pitch mixture and had customers who would take as much as 25,000 tons a year. Overall price for the mixture was 199s 9d.

Next witness for the Phenol Producers' Association was Mr. R. W. Lowe, chairman of the Association since 1949 and chairman and managing director of Charles Lowe and Co. (Manchester). He said that members of the Association had to undertake to hold the price fixed by agreement. There were no quotas and no penalties and members were free to leave the Association without giving notice.

Mr. Mackenna asked whether during Mr. Lowe's chairmanship it was true that the Association had considered the interests of the customers in its policy. Mr. Lowe said there was no question about that.

Having a stable price in the home market, Mr. Lowe said, has enabled his company to develop in a competitive export market in the sure knowledge that they were not going to be undercut by any other producer who might have been more fortunate in buying a 'distressed' parcel of phenol. If the phenol price at home had not been stable, he very much doubted that his company would have pursued its present policy.

It was estimated, Mr. Lowe reported, that Imperial Chemical Industries during last year had sold about 2,000 tons of phenol below the Association price. If the Association agreement continued, however, he did not think there would be any danger through I.C.I. being outside it.

'Violent changes' in the phenol industry if price-fixing ceased were predicted by Mr. Lowe during the fifth day of the hearing when he was being cross-examined by Mr. Roche. Mr. Lowe said that the first change would be a quick fall in price from 1s 4d to 1s a lb and it could easily fall lower. He considered that the small producers would be the first to reduce, because they had neither the storage capacity nor the finance to carry large stocks.

Monsanto Plant

Monsanto synthetic phenol plant worked in two portions—they worked for 150 days, stopped, cleaned the plant, and then worked for another 150 days, stated Mr. Rocke. He suggested to Mr. Lowe that they could adjust production by working only 120 days in each of the two portions of the year.

Replying, Mr. Lowe said it was his personal view that no synthetic producers in the U.K. would close down.

I.C.I.'s decision to leave the Association was raised by Mr. Roche.

Mr. Roche: "No doubt you had a discussion with their representative on that sad occasion?"

Mr. Lowe: "They had been threatening it for a long time, pending the Restrictive Trading Practices Act."

Mr. Lowe agreed that Hydrocarbon Chemicals had now started production and that Shell had transferred custom from I.C.I. to B.H.C. Supply and demand were factors taken into account in price fixing.

Asked if it had ever occurred to him that if that were the main factor, it might be ascertained by having a free market, Mr. Lowe said it undoubtedly could. His answer to a question on what was the main objection to that course, was that one had to look at it from a consumer's point of view, and he thought that stability of prices was a basis for encouraging the further use of phenol, or any other raw material. The export market was "more complicated" than the home trade. It would mean a financial hardship for producers of natural phenol to export, because the

return would be lower than the home-controlled price.

Mr. Lowe gave it as his opinion that production of natural phenol in 1960 would fall because there had been two years of large production and stocks of intermediates had been built up. The question of prices had been discussed with moulding powder manufacturers and moulders. It had been explained to them that if prices were not fixed, they might be up to 3s or 4s one week and down to 1s 3d the next.

Mr. Roche: "I have no doubt that over the years you have trained them well as to what answer is expected of them when asked if they like stable prices?"

Mr. Lowe: "I think it is very genuine that the companies engaged in the plastics and synthetic resin industry do like stable prices. That is what has helped them to build up their trade.

Continuing his evidence on the sixth day of the hearing, Mr. Lowe considered likely results of the ending of the Phenol Producers' Association's price-fixing agreement.

It had been suggested, said Mr. MacKenna, that a decline in the production of phenol consequent upon the ending of the agreement would affect the buyer only inasmuch as he would have to resort to overseas markets. Mr. Lowe said he had had some unpleasant experiences of such a situation. In 1951 his company was extremely short of phenol and needed additional supplies in connection with the resin side of the business. He had had to resort to imported phenol but instead of getting supplies at 1s. 6d./lb. as it then was, he had had to pay 5s. 4d./lb. He could only say that when this country had been short of phenol, a big figure had been paid for it.

Next witness was Mr. John Dyde, chairman of the Eastern Gas Board. His board produced the equivalent of about 130,000 tons of tar a year. At the moment the board disposed of it through two schemes—19 million gall. to Printar Industries and 4 million gall. to Midland Tar Distillers. There remained a balance of about 1 million which the board distilled.

Cross-examined by Mr. Roche, Mr. Dyde said "Taking the industry as a whole, we have never considered it in the public interest to burn what we regard as a rich storehouse of natural chemicals such as are to be found in tar. The uses of some are still unknown: otherwise why would we maintain an expensive research organisation to deal with such matters."

Opening the case on behalf of the Registrar of Restrictive Trading Agreements on the seventh day of the hearing, Mr. Roche stated that the "dire results" which, it had been said, would follow the ending of the Phenol Producers' Associations fixed price agreement, would not occur. He said that the Association was seeking to justify the agreement and certain ancillary restrictions only under Section 21(B) of the Act and therefore had to prove that removal of the restrictions would deny to the public as purchasers, consumers and users of any goods, specific and substantial benefits enjoyed by them.

It was submitted by Mr. Roche that it had not been proved that phenol would not in four years be available to the same extent as at present. He indicated that he would be calling seven witnesses, the first of whom would be Dr. Albert Parker, a chemical engineering consultant.

Dr. Parker reported that in the past 10 years annual production of phenol had risen from 13,000 tons to 40,000 tons. He thought that demand for phenol and other materials for making plastics would also continue to rise.

The hearing continues.

Fisons to Make No Further Statement Yet, Following Bid Rejection by B.D.H.

THE bid from Fisons comes at a time of great activity in the affairs of British Drug Houses Ltd. and no external help is needed to achieve the expansion programme other than that which has been assured by the company's bankers. This was the gist of the reaction to the formal offer made by Morgan Grenfell and Co., on Fisons' behalf, for the £1.2 million ordinary and £75,000 preference capital of B.D.H. The directors state that the offer was not invited, that the company expanded actively last year, and that an increased dividend and a scrip issue are forecast. Intimation of B.D.H.'s rejection was given in 'Distillates' last week.

Although the 1959 audit has not yet been carried out, B.D.H. group profits before tax are estimated at not less than £600,000 (£551,000) to which will be added £60,000 released tax provision. Should these figures prove correct it is understood that the directors would recommend that the dividend payable in July should be doubled to 24%, and in addition would advise a one-for-two scrip issue.

Despite the somewhat forthright tone in which the Fisons bid was rejected, it has been confessed by Mr. Geoffery Ely, chairman of B.D.H., that the size of the proposed dividend increase, and the scrip issue, were not unconnected with the takeover bid, though it was added that in any event B.D.H. would have paid more for 1959 without that incentive.

No further official statement is to be made yet in connection with Fisons' bid for the capital of British Drug Houses Ltd., Sir Clavering Fison, chairman of Fisons, has decided.

"F. W. Berk Deny Take-Over Offer"—see 'Commercial News', p. 368.

In Parliament

Study Group for Toxic Farm Chemicals

"TO study the need for further research into the effects of the use of toxic chemicals in agriculture and food storage, and to make recommendations" are the terms of reference of the study group whose names (below) were provided by Mr. J. B. Godber, Parliamentary Secretary to the Minister of Agriculture, Fisheries and Food, in response to a question in the House last week.

The study group is independent of the Interdepartmental Advisory Committee on Poisonous Substances used in Agriculture and Food Storage, which will continue.

Chairman: Professor H. G. Sanders, chief scientific adviser (agriculture), Ministry of Agriculture; Members: Dr. H. R. Barnell, chief scientific adviser (food), Ministry of Agriculture; Dr. J. M. Barnes, director, toxicology research unit, Medical Research Council; Professor A. R. Clapham, Professor of Botany, Sheffield University; Dr. R. A. E. Galley, director, Tropical Products Institute; Mr. C. O. Harvey, laboratory of the Government Chemist; Dr. Donald Hunter, C.B.E., physician to London Hospital; Mr. W. C. Moore, C.B.E., director, Plant Pathology Laboratory, Ministry of Agriculture; Professor W. L. M. Perry, O.B.E., Professor of Materia Medica, Edinburgh University; Mr. G. G. Samuel, scientific staff (headquarters) Agricultural Research Council.

Improved Testing Arrangements for Drugs Proposed

Mr. Derek Walker-Smith, Minister of Health, is considering a recommendation by the Committee on Cost Prescribing for the improvement of arrangements for testing drugs. He also said in the House on Monday that he hoped to make a statement shortly on the proposed Clinical Trials Committee. Among drugs the Home Secretary proposed to restrict to supply by prescription were: Preludin, Persomnia, Relaxa, Menopax and Miltown.

Chemicals Exempted from Import Duty

UNDER the Import Duties (Temporary Exemptions) (No. 2) Order, 1960—published as S.I., 216-1960—90 chemicals listed in the schedule have been temporarily exempted from import duty from 15 February until 1 October 1960, unless a shorter period is indicated.

Chemicals exempted from duty until 1 July are: sulphamic acid; cyclohexanone; fumaric acid; *sym*di-*o*-tolylguanidine; and 3:7-dinitroso-1:3:5:7-tetra-azabicyclo(3:3:1)nonane.

Chemicals exempted until 1 October include aconitic acid; dodecenylsuccinic acid, mixed isomers; malonic acid; glutamic acid; benzonitrile; thioacetamide; pyridine; and sodium sulphide (analytical reagent quality).

D.S.I.R. REPORT ON FUEL RESEARCH

Novel Catalysts Developed for Fischer-Tropsch Process

WORK at the Department of Scientific and Industrial Research's Fuel Research Station has been directed for some years to the development of processes for the gasification of fine coal. At the closing of the Station at the end of 1958 and the transference of research to the new Warren Springs Laboratory, at Stevenage, investigations on two types of gas producer operating under slagging conditions had reached a stage at which the basic information obtained would be of value if further large scale development of either type was contemplated.

One aspect of the gasification of fine coal which has been of major interest, the Fuel Research Board's report 'Fuel Research 1958' just published notes, is the production of gases containing carbon monoxide and hydrogen for the synthesis of oils by the Fischer-Tropsch process. As this process requires a synthesis gas to be essentially free from sulphur compounds continued attention has been given to desulphurisation processes.

Gasification in a Slagging Cyclone Generator. Gas made in this generator was of poor quality. On the basis of experience gained it was concluded that this type of generation would operate most satisfactorily on finely ground coal, to ensure that gasification could be completed in the short time of contact available. Any further development would involve modification in the method of feeding the fuel.

Synthesis Gas Purification. Work has been in progress on the removal of sulphur compounds at temperatures in the range 300-400°C at 21 atmos.-pressure using metal oxide contact materials. Zinc oxide, at 400°C, has been found to remove sulphur compounds almost completely from H_2S-free-water-gas containing 10-20 grains of organic sulphur per 100 cu. ft. until sulphur content of the material had reached about 30% by weight, corresponding to almost complete conversion to zinc sulphide.

Sulphur Removal

Spathic iron ore was found to remove about 90% of the organic sulphur from H_2S-free synthesis gas containing 10 grains of organic sulphur/100 cu. ft., until the sulphur content of the ore reached 4%. Heating in air at 400°C restored its acivity.

Experiments indicate that synthesis gas for the Fischer-Tropsch process could be treated satisfactorily in a two-stage process, using a suitable type iron ore to remove the bulk of the sulphur and zinc oxide for the final purification.

Oil from Coal. The most promising method of producing liquid and gaseous fuels economically from low-grade coal is a combination of gasification and Fischer-Tropsch synthesis, the Fuel Research Board records, and of the known variations of the Fischer-Tropsch synthesis, the liquid-phase (slurry) process, in which the gas mixture is passed through a suspension of an iron catalyst in high-boiling oil, appears best to meet the requirements from the point of view of economics.

Progress has been made in collaboration with an industrial concern, on the manufacture of iron catalysts suitable for the slurry process, and a study of the effect of ionising radiations has provided so far as is known, the first example of a significant and lasting improvement in the activity of a technical catalyst resulting from exposure to radiation.

Developing Commercial Catalysts. With degard to the iron oxide catalyst it has been confirmed that the presence of residual sulphate ion in amounts greater than approximately 0.2% of sulphur trioxide is deleterious to catalyst activity. Also it has been noted that an increase in activity and a greater improvement in selectivity occurs with increase in alkali content over the range 0.09 to 1.35 parts K_2O per 100 parts of Fe. Further preparations are in hand to determine the optimum alkali content. Other results also available indicate that for comparable sulphate contents an increase in the proportion of ferric iron improves selectivity without detriment to activity.

Tests in Slurry Reactor

Preheating of iron oxide in air at 550°C has an appreciable effect, the extent of sintering of the catalyst increasing and the gas conversion decreasing, with increase in time of pretreatment. Corresponding tests in a slurry reactor have shown a similar trend in the effect of pretreatment on gas conversion, and have also shown that while there was a decrease in catalyst activity, the selectivity to compounds of high molecular weight improved with increase in temperature of pretreatment. Mild conditions of pretreatment increased the proportion of middle distillates (150-250°C) in the liquid products. Controlled preheating in air appears, it is suggested, to provide a means for exercising some degree of control over product distribution.

Activating Catalysts. Variations in the initial treatment have been found to produce considerable differences in catalyst activity for synthesis with water gas at a temperature of 265°C.

Preliminary tests carried out on bench scale slurry reactors have shown that good catalyst performance, judged on the basis of subsequent operation with water gas at a pressure of 11 atm. and a temperature of 265°C was obtained when the initial operation was carried out at 285°C and atmospheric pressure using a CO-rich gas (H_2:CO = 0.67). Later results have shown that a catalyst operated initially at a temperature of 310°C gave a better overall performance in prolonged synthesis with water gas at a temperature of 265°C.

Surface Structure of Catalysts. In the work on supported catalysts for use in the synthesis of oil from coal it has been shown that it is virtually impossible to pump off more than two-thirds of the total volume of CO adsorbed on kieselguhr at −196°C. The very slow rate of desorption indicates that residence time of the absorbed molecule on the surface is of the order of 10 microseconds which suggests that an additional 6kcal actuation energy is needed for desorption.

Copper-based Catalyst

Novel Catalysts. Conventional catalysts for the Fischer-Tropsch synthesis based on iron or cobalt have an upper temperature limit of usefulness above which the production of free carbon in the crystal lattice of the metal is excessive during synthesis. On theoretical ground, it was considered that by incorporation of copper atoms in the manganous oxide crystal it should be possible to produce localised electronic configurations resembling that of iron, but without a lattice of catalytically-active metal on which free carbon would be produced.

A copper-manganous oxide catalyst is active for the synthesis of liquid products at temperatures from 350° to 450°C. The products obtained at 400°C were similar to those made at 320°C with a fluidised iron catalyst, but were characterised by a high proportion of compounds containing oxygen. Additional tests in a glass reactor at atmospheric pressure have shown that carbon formation on the catalyst is small at a temperature of 450°C.

Sulphur Removal from Flue Gas. The Fulham-Simon-Carves ammonia process for sulphur removal has been operated successfully on a large pilot plant by the Central Electricity Generating Board and Simon-Carves. The extent to which this process could be used industrially, the Fuel Research Board states, is dependent on the availability of supplies of gas-works ammonia liquor and work at the station has been continued with the object of discovering a cheap process of wider applicability.

Methods tried out for the removal of sulphur dioxide have included wet processes which would give sulphuric acid as an end product, and dry absorption processes. The latter would have the advantage that they do not involve cooling and wetting the flue gases, and so do not reduce buoyancy of the chimney plume discharge.

Wet Processes. Further work has been

carried out on a catalytic manganese process in which sulphur dioxide and oxygen are absorbed in water containing manganese ions as catalysts, and produce dilute sulphuric acid. Electrolysis of the liquor in the scrubber during the absorption of sulphur dioxide gave a marked improvement and in small-scale experiments sulphuric acid of 25% strength has been produced with an efficiency of removal of sulphur dioxide from flue gas of 95%. At higher concentrations, the efficiency of absorption decreased.

Recovery of sulphur dioxide by various cyclic processes has also been investigated. In one, flue gas is scrubbed with a suspension of zinc oxide in water containing an inhibitor to minimise formation of sulphate. Zinc sulphite is filtered from the water, dried and calcined at a temperature of 300°-350°C when sulphur dioxide is liberated and zinc oxide reformed. In general, the report notes, the higher the efficiency of absorption, the lower the efficiency of recovery.

Dry Processes. Experiments with alumina gel impregnated with trimanganese tetroxide were successful in recovering over 90% of sulphur dioxide from a gas stream, but excessive amounts relation to the weights of sulphur dioxide removed.

A disadvantage of using inorganic oxide, it is reported, is that after use it has to be heated to a high temperature (about 750°), to regenerate the oxide. The possibility of using active carbon which should require a much lower temperature for recovering adsorbed sulphur dioxide appeared to be attractive. It has been found, however, that although some active carbons tested gave satisfactory removal of sulphur dioxide at a temperature of 140°C and regeneration was accomplished by heating at 350°C under reduced pressure, the charcoals gradually deteriorated and after several successive adsorption and regeneration cycles, it was necessary to heat the charcoals to over 600°C to restore the initial adsorptive capacity.

Further investigations on these processes have been suspended as none have shown sufficient promise.

I.Chem.E. Plan Meetings on Chemical Hazards and Process Economics

PROCESS hazards and process economics are the subjects of two meetings of the Institution of Chemical Engineers that are likely to be of wide interest. A symposium on 'Chemical process hazards with special reference to plant design' is being organised by the North-Western branch at the College of Science and Technology, Manchester, on 29, 30 and 31 March. A symposium on 'Process economic and management', will be held by the Midlands branch at the Birmingham University on 5 April.

The meeting on process hazards will include a symposium dinner on 30 March. First session will be held at 2.30 on 29 March. Papers are as follows:

'Some significant chemical accidents', by Dr. D. Matheson (H.M. Inspectorate); 'An approach to problem of process hazards in plant design', by A. D. Thackara, R. B. T. Hall-Craggs & R. M. Robb (Hedley); 'Automatic control & instrumentation for hazardous process', by B. W. Balls & A. H. Isaac (Foxboro-Yoxall).

'Relief' of pentane vapour—air explosions in vessels', by J. H. Burgoyne & M. J. G. Wilson (Imperial College); 'Ethylene oxide vapour explosions under pressure', by J. H. Burgoyne & K. E. Bett (Imperial College) & R. Muir (Lankro); 'Explosion hazards in manufacture of terephthalic acid', by Dr. D. H. Derbyshire (I.C.I. Fibres).

'Quenching of flame by perforated sheeting & block flame arresters', by K. N. Palmer (Joint Fire Res. Org.); 'Explosion reliefs for duct systems', by Dr. D. J. Rasbash & Z. W. Rogowski (J.F.R.O.); 'Design of explosion reliefs for industrial drying ovens', by W. A. Simonds & P. A. Cubbage (Gas Council).

'Hazards in handling acetylene in chemical processes, particularly under pressure', by Dr. S. A. Miller & E. Penny (British Oxygen R. & D.); 'Design of plant handling hydrofluoric acid', by K. M. Hill & H. Knott (A.E.A.); 'Storage, pumping & piping of hazardous liquids by S. F. Grover & B. G. Wilson (Associated Ethyl).

The meeting on process economics will be held in the Chemical Engineering Department, Birmingham University, on 5 April starting at 9.30 a.m. The morning session on 'Process economics' will be under the chairmanship of Professor F. H. Garner (Birmingham) when the following papers will be read:

'Future pattern of the chemical industry', by L. S. Mumford (I.C.I.); 'Chemicals from coal', by A. Parker (consultant); 'Chemicals from petroleum', by A. N. Holmes (Shell Chemical); 'Development of full-scale processes', by L. W. J. Loveless & J. R. S. Morris (Courtaulds); 'Contractor's role in process development', by D. S. Petty (Lummus).

At the afternoon session, to be held under Mr. C. F. Kearton, managing director, Coutraulds, papers on 'The chemical engineer in management' will be presented by Professor N. A. Dudley (Birmingham); K. B. Ross (A.E.A.); F. Mayo (Esso); R. D. Hayes (Albright & Wilson); & R. H. Simpson (Monsanto).

General Chemical Prices Fell in January

WHOLESALE price index of the Board of Trade (based on a 1954 average of 100) showed a provisional January index of 105.6 for total sales of chemicals and allied industries sales, compared with 105.5 in December and 105.0 in January 1959. Provisional January index for home market sales was 106.9, a rise of 0.3 on December and 0.9 above the January 1959 figure. The following is an extract from the index:

	Jan. 1959	Dec. 1959	Jan. 1960
General chemicals ...	107.2	106.3	105.7*
Pharmaceutical chemicals	82.4	81.8	81.6*
Pharmaceutical preparations	101.1	101.0	101.1
Soap	126.6	128.8	128.8*
Soapless detergents ...	104.4	103.6	103.6
Synthetic resins and plastics materials ...	91.0	90.0	89.8*
Commodities wholly or partly imported			
Pyrites, c.i.f. U.K. ...	78.2	68.3	68.3
Sulphur, crude (for acid making), c.i.f. ...	78.3	77.4	75.6

*Provisional

Radiochemical Laboratory for Pilkington Brothers

A radiochemical building will be one of the features of the £2 million research centre of Pilkington Bros. Ltd., glass manufacturers, St. Helens, to be built at Lathom, Lancs. The research centre is being built on a 50-acre site.

Record Year for I.C.I. Plastics Division

SALES of Plastics Division's products reached a record high level during 1959, reports the February number of the *I.C.I. Magazine*. Home sales increased by 15% and "an even more spectacular advance was achieved in the export market, where sales were over 30% up on the 1958 figures."

Alkathene, I.C.I.'s brand of polythene, "contributed substantially to this very satisfactory state of affairs," the company's export sales of this material rising by almost 50%, while the "outstanding achievement of the year was successful conclusion of arrangements for I.C.I. and C-I-L to supply the polythene for the third transatlantic cable.

"The relaxing of hire purchase restrictions helped boost the sale of plastics used in cars, TV sets and household equipment, and p.v.c. goods based on 'Corvic' and 'Welvic,' such as sandals and beach shoes, leathercloth and long-playing records, made excellent progress."

On the debit side a drop in the sale of p.v.c. for plastics macintoshes is reported, "which can be blamed directly on the weather."

Reports from Wilton show that polythene output rose by 32% over the 1958 figure (itself a record year) and all Dyestuffs Division plants at Wilton had "an excellent year."

In the nylon plants, demand for the polymer had outrun supply, although production had exceeded design output by "several hundred tons." In preparation for 1960—target 13,500 tons—some new plant had been installed and much development work carried out.

Output of chlorine rose steadily week by week to a record in November—but December figures were "even better."

The Perspex factories at Billingham, Wilton and Darwen are reported to have been "hard pressed to meet the demand for sheet."

Paper on 'Soft' Detergents for I.S.P. Conference

DEVELOPMENTAL and experimental work carried out on the production of detergents which will be broken down at sewage works, thus reducing foaming of rivers, will be the subject of a paper entitled 'Biochemically soft detergents' that Dr. A. Key, chief chemical inspector, Ministry of Housing, will introduce at the annual conference of the Institute of Sewage Purification, to be held at Scarborough from 21 to 24 June.

Other papers will cover research on the development of the Bacon fuel cell utilising methane produced in sewage treatment processes, by Dr. H. H. Chambers, director, Sondes Place Research Institute; 'Two stage biological sewage treatment in Germany' by Dr. Ing. H. Rohde, deputy director, Ruhrverband, Essen, and 'Some biological aspects of sewage treatment', by Mr. H. A. Hawkes, of the Birmingham, Tame and Rea District Drainage Board.

Russian Design for Wet Catalysis Section of Vacuum Carbonate Sulphur Removal Plant

INTENDED for the production of sulphuric acid from hydrogen sulphide gas, obtained during the removal of hydrogen sulphide and cyanogen from coke oven gas, is the wet catalysis unit of the vacuum carbonate sulphur removal plant at Makeevka Coke and Chemical Works. The units so far constructed or under construction have been designed by Giprokhim (or Giprokoks).

In the monthly journal *Koks i Khimiya* (August 1959), which is now being translated under a cover-to-cover scheme, with the agreement of D.S.I.R. under the title 'Coke and Chemistry, U.S.S.R.', and produced by the Coal Tar Research Association (see CHEMICAL AGE, 6 February, p. 250), A. P. Sergeev describes the unit as follows:

Process. Hydrogen sulphide gas is burned in a furnace and sufficient excess air is used to produce a gas containing (1% by volume): SO_2 6.8-6.9: O_2 9.5, N_2 and CO_2. Due to the excess air and the high temperature, a proportion of the HCN (up to 40%) is converted to NO, the remainder forming free nitrogen.

Furnace gases, which have a temperature of 1,100°C, are passed to a waste heat boiler where they are cooled to 470°C before entering a converter. This latter is equipped with three catalyst trays and the heat of reaction is removed either by means of air coolers (the Makeevka recovery unit) or by injecting cold air above each tray (Yasinovka and Alchevka recovery units).

Absorption Tower

On leaving the converter the gases, which contain sulphuric acid vapour, SO_3, unreacted excess O_2 and nitrogen enter an absorption tower where they are cooled with sulphuric acid. The latter is continuously recirculated through the system: collector, acid pump, cast iron tubular cooler and absorption tower.

Sulphuric acid formed in the converter together with other gases and steam, condenses in the form of an acid mist on leaving the converter. Up to 70% of this mist is entrained by the recirculating acid, and the remaining 30% has to be completely recovered by an electrostatic precipitator which is of the MVT—3.5 type. Acid accumulating in the system is led off to a storage tank.

Disadvantages. There have been serious faults with the layout described above. Thus combustion of H_2S with excess air forms oxides of nitrogen which pollute the sulphuric acid. The nitrogen oxides adversely affect atmosphere and working conditions and cause rapid corrosion in lead saturators.

When the furnace gases are cooled in a waste heat boiler with a constant heating surface, the SO_2 content of gas entering the converter cannot be kept constant if H_2S input is varying. In certain circumstances, the gases cool to below the minimum conversion temperature (440°C) and the catalytic reaction will cease. To avoid this some coke oven gas is fed into the furnace for combustion, but the water produced dilutes the acid produced.

At high input rates, temperature of the gases leaving the boiler is very high but is lowered by diluting the gases with cold air, SO_2 concentration is reduced and increased air content necessitates a higher consumption of electrical energy.

Construction of the waste heat boiler is stated to be complicated in design. Also this boiler's casings and that of the furnace are liable to severe corrosion by condensates of weak sulphuric acid, so reducing the reliability of the entire installation. Repair time at the Makeevka unit has amounted to 1.5% of total operating time. Extraction of the heat by injecting air beyond the first and second sections in the converter has proved unsatisfactory as the additional volume increases the flow resistance and causes an extra consumption of electrical energy.

Design Faults Eliminated

Modifications. At Sergeev's suggestion, combustion of H_2S at Makeevka has been modified by burning it with the theoretical volume of combustion air. In this way, using a screened uniflow boiler, it is possible to obtain furnace gases containing 11.7-12% SO_2 and to eliminate some of the faults in the design noted above.

Boiler Construction. The screened uniflow boiler is mounted inside a spare furnace constructed of coils of boiler tube 57/4 and 51/5 mm. diameter. Four parallel sets of tubes are fitted with total heating surface $F = 30$ sq. metres (effective surface $F_{eff} = 27$ sq. metres). Air input is controlled automatically by means of a proportional controller with a correction for composition. Beyond the boiler, the gases are diluted automatically by means of an electronic potentiometer and pneumatic regulator.

Modifications for Gas Combustion. H_2S gas is fed to the boiler through an orifice meter. The pressure drop across the orifice controls the proportional controller which regulates a throttle in the air line supplying air to the burner. Gas is burned in the upper unscreened section of the boiler, at a temperature of 1,150°-1,180°C (depending on H_2S entering the furnace. The gases are cooled to 750°-770°C on passing through the fire box of the furnace and then flow into an after-burning chamber.

After-burning Chamber. This is a section of gas main lined with refractory brick, into which a determined volume (about 500 cu. metres/hr.) of air is passed. Checkered brickwork protects the chamber from furnace heat radiation. Temperature controllers at inlet and outlet indicate temperature differences both sides of the chamber. The process is so controlled that the temperature difference is positive and equal to 20 to 25°C.

Automatic Equipment. Immediately beyond the after-burning chamber the correct amount of air is added to the furnace gases to bring the mixture entering the converters to a temperature of 440°C and an SO_2 content of 6.8%.

Use of Condensate. Feed water for the tubes is condensate at a temperature of 98°C, to which sodium sulphite is added. In addition, condensate is pumped through a steel swarf filter to eliminate traces of oxygen. Pressure of the saturated steam produced is 4-9 atmos. For each ton of sulphuric acid produced, the yield of heat in the form of steam is 0.81 million calories. This steam is used in the absorbent solution recovery units.

Advantages of the New Method. Sulphuric acid is stated to be produced free from oxides of nitrogen. The equipment used to prepare the gas mixture has been reduced from two units (burner and boiler) to one. Working conditions in the converters are almost independent of the H_2S loading on the boiler, so that SO_2 concentration at entry to the converters remains constant. Corrosion of the furnace casing has been eliminated, it is recorded, owing to absence of any SO_3 in the gases and resultant formation of H_2SO_4. The boiler is extremely simple in design. Working conditions have been improved by virtue of absence of N_2O_3 from the acid; and because of reduced heat losses, the yield of steam has been increased to 80%.

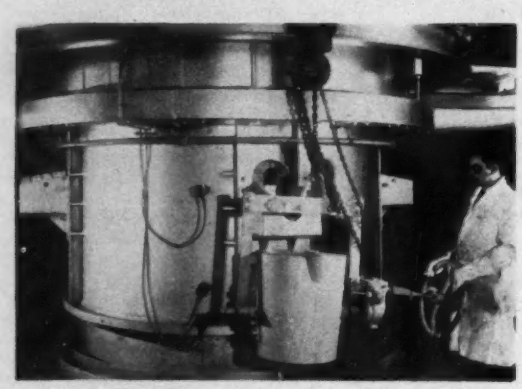
The unit at Makeevka has operated successfully and without breakdown for more than a year. It is recommended for use in newly constructed wet catalysis units, utilising both the uniflow boilers and the natural circulation boilers. Air coolers are discouraged as these wear out within a year. Design and construction of converters with air injection after the first and second layers are regarded as an irrational solution.

I.C.I. to Acquire Ulster Fertiliser Plant

To join with W. and H. M. Goulding Ltd. in the manufacture and supply of fertilisers in Northern Ireland, Imperial Chemical Industries Ltd. are to acquire from Goulding a 51% holding in Richardsons Chemical Manure Co. Ltd. and Ulster Manure Co. Ltd. These companies supply from factories at Belfast and Londonderry most of Ulster's fertiliser requirements.

It is intended that Richardsons shall build a new factory at Belfast to make concentrated complete fertilisers. The capacity of the new factory will be adequate to supply Northern Ireland's needs of these fertilisers for some years to come. The technical service and advice available to agriculture from Richardsons Chemical Manure and Ulster Manure will in future have the full backing of I.C.I.'s Billingham Division, including its Jealott's Hill Research Station.

CONTRACT SMELTING SERVICE FOR CALCIUM CARBIDE, ETC.



Preparing to tap the Birlefco pilot smelting furnace

A CONTRACT service for electric smelting, the first in the U.K., has been introduced by Birlec-Efco (Melting) Ltd., Westgate, Aldridge, Staffs. A pilot smelting furnace is now in operation at the Aldridge works to promote the development of electric smelting processes for calcium carbide, phosphorus, iron and manganese ores, production of ferro-silicon and ferro-chrome, nickel and copper concentrate, etc.

Customers' raw materials are accepted in trial batches for testing ameniability to electrothermal reduction and for determining the most suitable smelting technique and the nature of the resultant products. At a fee agreed in advance the pilot smelting furnace, which provides full scale testing facilities, is operated on customers' raw materials.

The plant is of such a size that valuable information is gained on important factors such as power and electrode consumption, operating voltage, percentage recovery, and other relevant data. This information can be scaled up so that a fairly accurate appraisal can be made of what can be expected on a large scale plant.

With a shell of 8 ft. internal diameter, the furnace is situated at one end of a building designed and built for the purpose. It is surrounded by a charging platform at a height of 9 ft. from the main floor level. The furnace controls are suitably housed in a panel adjacent to the furnace operating platform. With a nominal rating of 350 kVA, the furnace is designed to be as versatile as possible.

Several thermocouples are built into the refractory lining to monitor the temperature of the hearth and sidewalls at different points. The furnace is equipped with holders suitable for 8 in. diameter electrodes which can be amorphous carbon or graphite according to the requirements of the tests. Smaller electrode holders can be fitted if necessary.

The furnace is designed so that it can operate as an open-top furnace or the top can be closed by the superimposition of a roof. It is also arranged for fume removal or gas extraction.

Beryllium Machining Plant Opened at Coventry

ELABORATE safety precautions are a main feature of the newly opened beryllium machining plant at Coventry of Sir W. G. Armstrong Whitworth Aircraft, a member of the Hawker Siddeley Group, who believe it to be the first such plant to become operational in Europe.

This follows the news (CHEMICAL AGE, 19 December 1959, p. 895) of I.C.I. Metals Division's Witton plant for production of this material, also said to be first of its kind in the European field.

Armstrong Whitworth are to produce beryllium components for the latest type of nuclear reactors, and the material has also been selected as a canning material for fuel elements in the new advanced gas-cooled reactor at Windscale.

Some £3 has been spent on employee protection in the new plant for each £1 on normal manufacturing facilities; the elaborate safeguards include pressure shells supplied with filtered air which is changed every three minutes, as well as special protective clothing, self-contained laundry and shower baths for personnel.

The metal is also of interest to aircraft engineers because of its low density and high elastic modulus; although scarcity will probably be a cause of delay in wider, and more bulky, applications. I.C.I.'s Witton plant when opened was capable of producing some 10 tons annually. Supplies of beryllium are received from I.C.I. to whom larger swarf shavings will be returned for possible remelting. Swarf dust is removed in 20 lb. containers which are placed in 300-lb. boxes and disposed in disused mines or the sea.

Elaborate laboratory and analytical monitoring is carried on to maintain standards of health safety. In the event of trouble, such as fire, the filter plant containing beryllium dust at the bottom of the 120-ft. stack can be flooded in five seconds.

A.E.A. Develop Automatic Monitor for Beryllium

A FULLY automatic monitor which will record in 6 seconds a sudden increase in the concentration of beryllium in the air of workshops or laboratories has been developed by the Chemistry Division of the U.K. Atomic Energy Research Establishment, Woolwich, London.

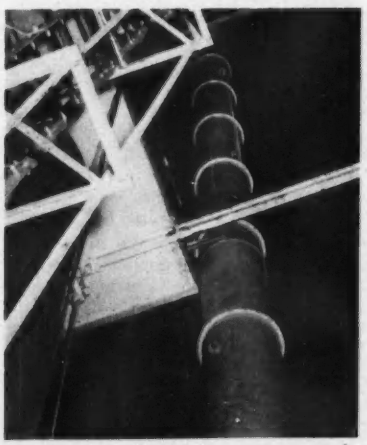
Concentrations of the metal or its compounds should not exceed 2-millionths of a gramme per cubic metre and the new device will provide measurements over the range 1- 75-millionths of a gramme per cubic metre. It will record a series of results at one-minute intervals and can be used for monitoring mercury, lead, chromium, manganese, silicon, arsenic, antimony, zinc and copper.

The device operates by photoelectrically measuring the intensity of u.v. light obtained from the beryllium sample by subjecting t[illegible]n electric arc.

P.V.C./Steel Ducting in New Beryllium Plant

THE plastics-coated sheet steel known as Stelvetite forms the interior of a p.v.c./steel/reinforced epoxy resin laminate used for a ventilating shaft fabricated by Ductwork Ltd. and resin coated by Parglas Ltd., installed inside an existing reinforced concrete stack 270 ft. tall at the works of the National Smelting Co. Ltd., Avonmouth.

Stelvetite was suggested by Parglas "as the most economical means of providing the basis of a rigid structure which, with its internal lining of p.v.c., would be resistant to the traces of acidity present in the filtered ventilation gases": the external applied coating of epoxy resin being resistant to the traces of ammonia in the surrounding atmosphere. The structure forms part of the new beryllium plant which has been in production since November, which provides this metal for sheathing uranium elements and other purposes. Produced by John Summers and Sons Ltd., Chester, Stelvetite can be "bent, formed, deep-drawn and welded".



P.v.c./steel reinforced epoxy resin laminate ducting installed inside a reinforced concrete stack 270 ft. tall

STANDARD OIL USE PHILLIPS' HYDROFLUORIC ACID ALKYLATION PROCESS

HYDROFLUORIC acid is a major chemical catalyst in wide use in petroleum refining. Although a comparative newcomer in refining technology, hydrofluoric acid is equal technically with sulphuric acid as an alkylation catalyst.

Phillips Petroleum Co., one of the foremost investigators of the alkylation reaction, developed the first non-catalytic process for alkylation of ethylene with *iso*butane to form neohexane and built the first catalytic process using hydrofluoric acid for the alkylation of butylene with *iso*butane to form the alkylate, mostly *iso*octane.

The two-step reaction, catalysed by HF, can be expressed as follows:

butylene + HF → organic fluoride (1)

organic fluoride + *iso*butane → alkylate + HF (2)

Combining (1) and (2) the net result is:

butylene + *iso*butane → *iso*octane (3)

Recently Foster Wheeler Corporation, U.S., completed a hydrofluoric acid alkylation unit at the Mandan, North Dakota, refinery of the Standard Oil Co. (Indiana) which produces 1,650 barrels/day of high octane motor gasoline component. Basic process design was supplied by Phillips Petroleum Co., licensors of the process and Foster Wheeler provided mechanical design, procurement and contraction.

Excess of Isobutane

Flow Process. For optimum reaction condition certain process specifications are required. The most important is that there should be a substantial excess of *iso*butane at the moment of reaction, so giving optimum yield and quality of product. Increasing the iC_4/olefin ratio improves the yield and octane of the alkylate and decreases acid consumption. Even under reaction conditions approaching the ideal, some slight polymerisation takes place. This is reflected in the production of an acid soluble oil which reduces acid strength below the optimum level. The main effect of a drop in acid strength is to increase the amount of combined organic fluorides in the hydrocarbon stream leaving the reaction system, and leads to more chance of losing HF in the product stream.

Combined feed, including the volumetric requirements of olefin and *iso*butane for the reaction, after passing through the bauxite drying system operating in a cyclic regeneration pattern for removal of any entrained water, mixes with the recycle *iso*butane stream and enters the reactor. HF acid also enters the reactor from three sources: from the acid rerun column; the main circulating acid streams of the depropaniser from the settler; and from the overhead streams of the depropaniser and the HF stripper. Rate of circulation of the main acid stream at Mandan is stated to be about equal to the total fresh feed volume. Water circulating in the tube bundle maintains the temperature at 85°F. A pressure of 80 p.s.i. is maintained in the reactor to provide a liquid phase for both the reactants and inerts in the total feed.

Effluent from the reactor flows to the settler; acid, as the bottom layer, is pumped back to the reactor; a slipstream is routed to the acid rerun column where acid soluble oil is rejected as bottoms; the top of the column vapour is HF which is condensed and returns to the reactor. An *iso*butane stream is vaporised and enters the column where it functions as a stripping medium. The upper hydrocarbon layer in the settler is pumped through a heater into the depropaniser. Propane overhead from this column, after condensing and settling, is pumped to the HF stripping column where practically all of any entrained HF from the reactor is removed. This acid settles out in the combined settler-accumulator of these two columns and is returned to the reactor. Bottoms from the stripper is propane product, which flows through a cooler to caustic heating and then to storage.

Bottoms from the depropaniser flows to the de*iso*butaniser where *iso*butane is removed as overhead and, after cooling, is returned to the reactor as the important excess *iso*butane necessary for optimum reacting conditions. The de*iso*butaniser is equipped with a direct-fired reboiler in which outlet temperature is high enough to break down any organic fluorides into HF and hydrocarbons. HF returns to the reactor with the recycle *iso*butane stream. Bottoms from the de*iso*butaniser flows to the debutaniser where normal butane is removed as an overhead product. Bottoms from this column is the alkylate which, after cooling and treating with caustic, flows to storage.

Polymorphous Polythene for Stronger and Clearer Packaging Films

IMPROVEMENT in both strength and clarity of general purpose packaging films is claimed by Spencer Chemical Co., Kansas City, Mo., U.S., for their new series of polymorphous polythene resins. The better film properties are stated to be due to the new resin's molecular structure, which differs from existing materials by having a controlled balance of long more-linear chains with shorter branched chains. This type of structure is stated to allow crystalline behaviour to be controlled during film-making operations. In a paper presented to the National Flexible Packaging Association in New York, Spencer's plastics technical director, Dr. George Ham, claimed that films from the new polythene resins gave 10 to 15% better 'see-through' properties (nearly glass-clarity) along with the strength of conventional opaque polythene films; 20% better resistance to breakage caused by impact; and 20 to 25% more resistant to straight-line tears. Moreover, in making films from the new resins, wide ranges are stated to be possible in processing temperature, film take-off speeds, blow-up ratios, and roll tensions.

A new process, details of which have not been released, is used to make the polymorphous resins. Strict control of molecular weight distribution and the branched-to-linear ratio, this latter being the key to film properties, are admitted.

With the new resin, crystals are stated to develop in a more random, less hindered way, although still remaining small enough to give a good balance of optical and mechanical properties. This crystallinity, states Dr. Ham, eliminates many of the stresses normally found in film resins. Also, the direction of normal polythene's crystalline orientation and the direction in which film is being extruded are the same. Crystallites of polymorphous polythene, however, become orientated in all directions during extrusion, so cancelling directional effects. It appears that the crystals are suspended in a matrix of less viscous highly-branched polythene. Thus the random placement of the small crystal elements in the new resin means that the new film will not tear in straight lines, and the unusual balance of crystalline and non-crystalline elements gives them better impact-resistance.

Spencer Chemical believe that these polymorphous resins will have a good chance of capturing a greater share of the U.S. packaging film market, estimated to be about 240 million lb. in 1959. The company is expanding its annual polythene capacity to around the 120 to 135 million lb. mark by the end of this summer.

Several hundred thousand pounds of the new plastics material have been field-tested to date. Trade names of the new product are Poly-Eth 5305, 5365 and 5375 and the price is the same as that for conventional materials—35 cents/lb.

Battersea Easter School on Physical Techniques

A course on physical techniques in inorganic chemistry has been arranged by the Chemistry Department of the Battersea College of Technology to run from 4 to 8 April. Topics to be covered include: spectroscopy, ion exchange, magnetochemistry, radiochemistry, stability constants, bond distances, phenomena, nuclear magnetic resonance, and automatic control.

Practical work is offered as a choice of two of the following: Spectroscopy (u.v., visible and i.r.), solvent extraction, ion-exchange, magnetic susceptibility, polarography, complexometry, radioisotopes and conductivity.

Letter to the Editor

Would 'Plastemul' Fill the Gap in Emulsion Terminology?

SIR—The title of your review of the lecture by Dr. C. G. Sumner ('Emulsion terminology criticised,' CHEMICAL AGE, 13 February, p. 281) prompts me to write on the subject.

Vinyl Products' Monograph No. 1, 'Polyvinyl Acetate Emulsions,' introduces the term 'emulsion' in the following way:

> "Polyvinyl acetate emulsions are dispersions of finely divided particles of polyvinyl acetate (p.v.a.) in water. The term 'emulsion,' which normally refers to a dispersion of one liquid in another, is therefore incorrectly applied because the particles of p.v.a. are in a semi-solid state. However, on account of its wide acceptance, the term 'emulsion' will be adopted throughout this publication. The designation 'latex' is also sometimes used in describing p.v.a. emulsions since they bear a superficial resemblance to the aqueous dispersions of natural and synthetic rubbers."

Outside the United Kingdom the term 'dispersion' is often applied to the many varied products of emulsion polymerisation. We are therefore faced with the anomaly of three different terms used in different contexts to describe similar or even identical products.

In the case of waxes, emulsified in the molten state, it is probably more correct to refer to the final product as a dispersion since the discontinuous phase is composed of a crystaline solid of sharp melting point. Emulsifiable polyethylene 'wax' is widely used as an alternative to natural waxes but may be considered as a hybrid since on many counts it lies between natural waxes and thermoplastic polymers in its physical properties.

The field of synthetic resin 'emulsions' presents us with the extremes exemplified by hard, high-melting, polystyrene and soft, semi-liquid, lauryl polymethacrylate; polyvinyl behenate is a case of a synthetic resin which can be prepared by emulsion polymerisation, yet the polymer has a low and sharp melting point.

It therefore appears that neither 'dispersion,' 'emulsion,' nor 'latex' is a suitable term to express in a meaningful way the vast and increasing range of synthetic resin products now invading so many industrial and domestic applications. There is a strong case for Dr. Sumner's conclusion that "it would be helpful to have a new term to describe a system which was made by emulsification but was not necessarily an emulsion in the classical sense under the conditions of use."

Since correct terminology is so frequently dependent upon the plastic or thermoplastic nature of the discontinuous phase, the term 'Plastemul' might fulfil the requirements. But this hardly looks pretty, and perhaps even has the flavour of a trade mark.

Yours, etc.,
G. E. J. REYNOLDS,
Assistant Research Manager.
Vinyl Products Ltd.,
Carshalton.

Dyestuffs Chargeable Under Import Duties Act

From 2 March, synthetic organic dyestuffs and certain allied products will be chargeable under the Import Duties Act, 1958, and subject to an import duty of 33⅓% *ad valorem*. This brings them into line with other chemicals and will replace the quantitative restrictions formerly applicable.

CIBA's Araldite Epoxy Resin Resurfaces Johnson, Matthey Flooring

Before and after! Part of a workshop floor at a factory of Johnson, Matthey and Co. Ltd. which has been treated with 'Araldite' epoxy resin surface material by CIBA (A.R.L.) Ltd., Duxford, Cambridge. Badly pitted by oil saturation and iron-wheeled traffic, the left-hand picture shows conditions of surface before treatment

DIARY DATES

MONDAY 29 FEBRUARY

C.S.—Cambridge: University Chemical Lab., Lensfield Rd., 5 p.m. 'Rotational isomerism (& energy barriers) in organic nitrites', by Dr. P. Grey.
C.S.—Nottingham: Chemistry Dept., University, 8.15 p.m. 'Chemical engineering aspects of atomic energy', by Prof. P. V. Danckwerts.
C.S.—Swansea: Dept. of Chemistry, University Coll., 5.15 p.m. 'Design in high polymers', by Prof. C. E. A. Bawn.
S.C.I.—London: 14 Belgrave Sq., S.W.1., 5.30 p.m. 'Colloidal stability of natural rubber latex', by Dr. E. G. Cockbain.

TUESDAY 1 MARCH

Plastics Inst.—London: Wellcome Building, 183-193 Euston Rd., N.W.1., 6.30 p.m. 'Recent investigations into polymer degradation', by Dr. N. Grassie.
S.C.I.—London: 14 Belgrave Sq., S.W.1., 6.30 p.m. 'Some new aspects of crystallisation of high polymers', by Dr. A. Keller.

WEDNESDAY 2 MARCH

S.A.C.—Birmingham: Queen's Hotel, Stephenson Pl., 4.30 p.m. Society a.g.m., 5 p.m., Bernard Dyer Lecture: 'Contribution of analytical chemistry to medical progress', by Prof. A. C. Frazer; 7 p.m., S.A.C. annual dinner.

THURSDAY 3 MARCH

C.S.—Salford: Royal Technical College, 5 p.m. 'Recent developments in chemistry of some less common elements', by Prof. R. S. Nyholm.
Inst. Metal Finishing.—Manchester: Engineers' Club, Albert Sq., 7.30 p.m. 'Sequestering agents in plating', by Dr. T. K. Aiken.
Plastics Inst.—Southampton: Chemistry Dept., University, 7.30 p.m. 'Polycarbonates', by Farben-fabriken Bayer AG.
Polarographic Soc.—Woking: 55 Oriental Rd., 7.30 p.m. 'Behaviour of the dropping mercury electrode', by C. Wontner.
R.I.C.—London: West Ham College of Technology, Romford Rd., E.15., 6.30 p.m. 'A chemist's thoughts on chemotherapy', by Dr. H. J. Barber.
R.I.C. with Inst. Pet.—Chatham: Medway Coll. of Tech., Maidstone Rd., 7. p.m. 'Use of platinum catalysts in petroleum refining', by Dr. J. M. Pirie and H. Connor.
S.C.I.—Bristol: Chemistry Dept., University, 6 p.m. Branch a.g.m., followed by 'Some aspects of photographic reproduction of colour', by Dr. H. Baines.
S.C.I.—Nottingham: Gas Showrooms, 7.30 p.m. Branch a.g.m., followed by 'Present-day problems of food microbiology in relation to food-borne diseases', by Dr. Betty C. Hobbs.

FRIDAY 4 MARCH

C.S.—Birmingham: Large Chemistry Lecture Theatre, University, 4.30 p.m. 'Weak, very weak and extremely weak bonds', by Dr. L. J. Bellamy.
C.S. with R.I.C.—Newcastle upon Tyne: Chemistry Dept., King's Coll., 6 p.m. 'Biogenesis of porphyrins', by Prof. A. Neuberger.
S.C.I.—Glasgow: Royal Coll. of Science, 7 p.m. Branch a.g.m., followed by 'Recent advances in fat stabilisation', by Dr. N. Uri.

Griffin and George to Equip New Laboratory

A contract has been secured by Griffin and George Ltd., Ealing Road, Alperton, Wembley, for supply of the scientific equipment for the laboratories of the new Mid-Hertfordshire College of Further Education at Welwyn Garden City, Herts. The order, which includes complete scientific equipment with the exception of "certain very specialised pieces of equipment" is worth £10,000.

Obituary

Dr. Z. K. A. Moszynski, aged 53, principal scientific officer of the British Coke Research Association, died at his home in Chesterfield, Derbyshire, on 13 February. Born in Poland, Dr. Moszynski came to this country during the war and served in the Polish Parachute Brigade. Later he carried out research on the use of carbonised peat/coal blends for mobile gas structures at Birmingham and Leeds Universities.

Overseas News

DU PONT'S TEFLON 100 CAN BE EXTRUDED OR MOULDED WITH STANDARD EQUIPMENT

NOW available from E.I. Du Pont de Nemours and Co. Inc. is a tough new Teflon—Teflon 100. Similar to Du Pont's homopolymers of tetrafluoroethylene (TFE), Teflon 100 is a copolymer of the two gases—hexafluoropropylene and tetrafluoroethylene; it is fully fluorinated. The company predicts wide uses for it in electronics and chemical processing.

Like TFE resins, Teflon 100 is stated to have excellent resistance to chemical attack, good electrical insulating, anti-stick and frictional properties. Also it does not absorb moisture. Structurally, however, this new resin differs from TFE in that its copolymer chain is branched. Also, it has a lower temperature service level. While TFE resins withstand up to 500°F and even higher temperatures for short periods of time, parts moulded of Teflon 100 are serviceable only to 400°F. At extreme low temperatures—down to −450°F—Teflon 100 is stated to resist impact better than other plastics do at low temperatures.

While the present TFE resins have to be processed like powdered metals, the new resin can be processed by screw extrusion, injection, compression, and transfer and blow-moulding, vacuum forming and coating by fluidised bed methods. This should allow Teflon 100 to be used as jackets for coaxial and multiconductor cable, aircraft wiring, moulded electronic components, laboratory tubing, and chemical equipment linings, Du Pont suggests. Films of Teflon 100 are already being marketed.

Du Pont have already started up a plant at Parkersburg, West Virginia to make Teflon 100, which sells in bulk load amounts at $11.60 a lb.

Austrian Polypropylene Plant May be on Stream in November

If the erection of the plants of Danubia-Petrochemie AG at Schechat near Vienna continues at the present pace, the company will be able to start production of the new thermoplastic material Daplen in November. Danubia-Petrochemie are a new concern in whom Stickstoffwerke, Linz and Montecatini, Milan, each hold a 40% interest, with the remaining 20% held by the Austrian State.

Initial part of the scheme, involving an expenditure of Sch200 million and due for completion before the end of the current year, will permit an output of 5,000 tons a year of Daplen, a polypropylene.

Construction of a pipeline which will bring methane to the plants, will be started in March, and in May installation of process equipment will begin. Until the new refinery starts operating, the petroleum feedstock will be supplied by Montecatini. Some Danubia-Petrochemie technicians have already undergone a course of training at the Montecatini plants in Ferrara, Italy.

Approval for E.N.I.'s Gela Petrochemical Plant

The Italian Ministry of State Investments has authorised Ente Nazionale Idrocarburi (E.N.I.) to build a Lire 100,000 million group of petrochemical plants at Gela, Sicily, to utilise the locally found oil. This oilfield is expected to give about 3 million tons of oil a year. The features of the oil are, however, such as to require special processing to convert it into products of commercial value.

Thus, the oil will be subjected to preliminary processing (coking) which will yield petroleum coke, liquid hydrocarbons, and gases. The coke produced will be utilised for a 150,000 kW power station that will produce power for the new plants, selling surplus electricity to local consumers.

The liquid hydrocarbons will be processed to obtain gas oil, diesel oil, fuel oil, gasoline, and other commercial products.

Sulphurous gases will be used for the production of sulphuric acid while gases rich in hydrocarbons will serve for the production of polythene and other derivatives as well as liquefied petroleum gases usable as fuel. The new plants will also include a unit for desulphurisation and a plant for the production of synthetic ammonia, which will be used in the production of ammonium sulphate and urea.

Work Starts on New Australian P.V.C. Plant

Work is to begin immediately on a new £A2 million chemical plant at Altona, Victoria, for the manufacture of a range of p.v.c. materials. The B. F. Goodrich Chemical Co. and C.S.R. Chemicals, in whom the Distillers Co. hold a 40% interest, will construct the new plant as part of a £A28 million petrochemical complex being established in Altona, designed to make Australia almost independent of imports of p.v.c. Production is scheduled to start next year.

Degussa to Produce Plastics Cyanides and New Carbon Blacks

Deutsche Gold- und Silberscheideanstalt AG, Frankfurt, are to take up new lines of production. A new investment plan, starting in the present financial year—which ends this autumn—foresees the spending of almost £4.25 million annually on research, development and new installations and methods. Stress-points of the future investment programme will be in the field of plastics, cyanides, prussic acid derivatives and new carbon black types.

Degussa have as full subsidiaries the chemical concerns of Dr. L. C. Marquart AG, Beuel, Chemische Fabrik Grünau, Frankfurt, Chemiewerk Homburg AG, Frankfurt, and Chemische Fabrik Wesseling AG and have holdings in the metallurgical concern Norddeutsche Affinerie, Hamburg, the Frankfurt concern Degesch, Kulzer and Co. GmbH, Bad Homburg and the two gas-carbon black concerns of K.G. Deutsche Gasrusswerke GmbH and Co. and Deutsche Gasrusswerke GmbH, both of Dortmund.

Australian I.C.I. Alkali Plant to be Expanded

Work at the South Australian alkali works of I.C.I. (Australasia) Ltd. is about to be started on extensions costing £A1.3 million, bringing the company's total investment in alkali production to more than £A10 million.

Annual sales value of alkalis in Australia is about £5 million sterling. The enlarged plant capacity will enable soda ash output to be increased by about 30%, lifting gross output of the works to 160,000 tons a year. The expansions will meet the increasing local demands for soda ash. Stages of the plant will be brought into production progressively. The whole will be finished in two years. About 85% of the total cost will be spent in Australia.

The Osborne works makes the whole Australian production of soda ash and sodium bicarbonate. It also produces caustic soda. Salt and lime, the two principal raw materials for the Osborne works, come from the company's salt fields at Dry Creek and quarries at Penrice.

Hüls to Introduce New Polybutadiene Rubber

Chemische Werke Hüls AG Marl have purchased the licence for the production of polydiolefins from the coal and carbon study company Studiengesellschaft GmbH, Mülheim-on-Ruhr. The first product which the company is to manufacture with the help of this process is the new polybutadiene synthetic rubber type. Hüls have developed two new processes, utilising catalysts invented by Dr. C. Ziegler, Max-Planck-Institute, Mülheim. Polybutadiene rubber, to be introduced to the market by Hüls this spring, is said to produce a rubber of natural type, but with more advantages than those of natural rubber when it is used in combination with the natural product. It will not compete with any rubber types at present produced by the Hüls 50-per-cent subsidiary, Bunawerke Hüls GmbH.

Mixtures of polybutadiene rubber and natural rubber are outstanding for their excellent hysteresis properties, e.g., large tyres made of this product will run less hot under load. Further tests have shown that compounds containing oil and car-

bon black are likewise interesting as base materials. Owing to these properties the new synthetic rubber type is expected to have good prospects.

Chemical Plant for Kuwait

Kuwait has ordered a chemical plant for production of chlorine, caustic soda and nitric acid from the Swiss concern Krebs and Co. AG, of Zurich. Starting material for the electrolytic manufacture of these products will be the salt solution left after the production of drinking water from sea water by distillation. Apart from mineral oil installations, this will be the first-ever chemical plant in Kuwait. Production is expected to start in the middle of 1960.

Russians May Sell Petroleum Products in Australia

Mr. Igor Fedovov, an executive of the Soviet Export Commission for crude oil is in Australia for discussions on the export of Russian crude oil to Australia. The First Secretary of the Soviet Embassy, Mr. Ivan Skripov, said that enquiries had been received from Australian businessmen who wanted to import Russian oil, chemicals, glass, foodstuffs and other items.

The Trade Department told the Soviet Embassy that the Government did not tell importers where to buy oil and that Russian suppliers could compete on normal commercial terms for a place in the Australian market.

Union Carbide in Manila

Technical executives of Union Carbide International have gone to Manila to make an investigation of local conditions relating to the establishment of an integrated multiple chemical plant. They have in mind a carbide-caustic soda-polyvinyl chloride operation to be located in Iligan.

The proposed plant would be self sufficient in raw materials and ensure a steady flow of these chemicals to local end-users. It would be a joint venture of Union Carbide and the Guevara interests.

Israeli Chemical Plant Firm will Represent Foreign Concerns

The major Israeli chemical company, Fertilizers and Chemicals Ltd., has founded a company under the name of Industrial Chemical Equipment Ltd. for development, construction and foreign trading in chemical equipment. The company plans to represent foreign concerns in Israel and for the future anticipates the export from Israel of chemical plant and data. Investments in the country's chemical industry up to 1964 are estimated as £1100 million (almost £20 million) of which 40% is intended to be spent on new equipment.

Hercules Powder to Expand Foreign Production

The U.S. chemical producers, Hercules Powder Co., Wilmington, Delaware, are to expand their foreign production network considerably. At present with two plants in the U.K. as well as installations in the U.S. and Canada, a plant in Mexico and further holdings in the U.K. Hercules hope to set up production units in Holland and Scandinavia and possibly a plant somewhere in South America. A further new factory is projected either for the Far East—probably Japan—or Australia.

New Pakistan Dyestuffs Plant has West German Backing

A new dyestuffs plant of Pakdyes and Chemical Ltd., Karachi, was recently opened at Daudkhel in the Punjab. The capital of the Rs6 million company is held 70% by the Pakistan Industrial Development Corporation, 15% by Farbenfabriken Bayer AG, Leverkusen, and 15% by Farbwerke Hoechst AG, Frankfurt. Bayer are at present responsible for the plant's technical administration.

German Companies Offer Aid for Indian Intermediates Industry

An agreement has been signed in New Delhi between the Indian Government and the three German successor companies of the former I.G. Farben group —Badische Anilin- und Soda-Fabrik AG, Farbenfabriken Bayer AG, and Farbwerke Hoechst AG—under which the German companies will put at the disposal of India their long experience in production of chemical intermediates. India is now building her first plant of this type in the Bombay area, annual output of which is planned to be worth some Rs100 million. The West German firms will supply aid for the project in the form of machinery, plant and technicians. It is believed that the Soviet Union has already attempted to sign a similar agreement with India.

First French Plant for Acetylene from Methane

Now in operation at their Carling, Moselle, works, is Houillères du Bassin de Lorraine's acetylene-from-methane unit. This is the first acetylene production plant to be based on methane, which is extracted from the company's Carling and Marienau coke over gas oven. It is also the first in the world to employ the technique developed by Société Belge de l'Azote et des Produits Chimiques du Marly (S.B.A.), Liege, Belgium (see CHEMICAL AGE, 13 February, p. 288). Houillères du Bassin de Lorraine have modified the technique to produce acetylene from gas or liquid raw materials.

Acetylene from Carling is used for acrylonitrile production by Ugilor, a subsidiary of the Ugine group and Houillères du Bassin de Lorraine. Capacity of the new acetylene plant is such as to enable Ugilor to implement their expansion programme which is to increase acrylonitrile capacity and production to 10,000 tons a year. Also by using their available coke oven gas, Houillères du Bassin de Lorraine will be able to rationalise their new carbonising programme which has been instituted to increase their coke delivery to the iron and steel works in Lorraine.

Du Pont to Make Nitric Acid in Ontario

Du Pont of Canada Ltd. will begin production of nitric acid within two months at a new section of the company's commercial explosives plant near North Bay, Ontario.

Lockheed Buy Half Interest in Rocket Propellant Firm

Lockheed Aircraft Corporation are to acquire a 50% interest in the Grand Central Rocket Co., Redlands, Cal, the fourth largest U.S. producer of solid propellants, who are developing an escape rocket for the Mercury 'man-in-space' project. Among their current work is the development of a high-energy propellant for the Nike-Zeus programme.

Founded in 1955, Grand Central Rocket became a subsidiary in 1958 of Petro-Tax Chemical Corporation, Houston, Texas, producers of butadiene and other petrochemicals.

German Fatty Acids Plant for India

Two complete installations for the high-pressure splitting of fats and for the distillation of fatty acids have been ordered from the Butzbach, West Germany, firm of Pintsch Bamag AG, for India.

New Route to 16-β Substituted Steroids

ANOTHER route to 16-β-substituted steroids is announced by chemists at Chas. Pfizer and Co. Key is new intermediate that can be used to make 16-β-fluoro- and 16-β-methoxy corticosteroids.

Developed by Dr. Walter T. Moreland, Rudolf G. Berg and Dr. Donald P. Cameron at Pfizer's Groton, Connecticut, laboratory, starting material for the new series is a 16-β-bromo-17α, 20:20, 21-bismethylenedioxy steroid, prepared by treating the readily available 16-β-bromo-17, 21-dihydroxy-20-keto compound with formaldehyde. Reacting the 16-β-bromo intermediate with the appropriate silver salts yields the corresponding acetoxyl, hydroxy, methoxy and fluoro compounds. Some of these compounds have been made from each other by the Pfizer team. Thus the hydroxy derivative has been prepared from the acetoxy as well as from the bromo compound. Derivatives bearing the corticoid side chain are obtained by removing the bismethylenedioxy protection.

Reporting their work in the *Journal of the American Chemical Society* (1960, **82**, 504) Dr. Moreland *et al.* say that a significant result is that all the reactions so far yield only one isomer—the beta form. Also the substitutions take place only with silver salts.

Although no commercial importance can as yet be attached to the compounds, the route developed to make them is thought likely to have a wide use.

PEOPLE in the news

● **Mr. Peter Wrightson, O.B.E.,** managing director of Head Wrightson and Co. Ltd. since 1955, has been appointed vice-chairman and managing director.

● Vice-chairman of Unilever Ltd., **Mr. George Cole,** is to become chairman of the company in succession to **Lord Heyworth** who, as already announced, is retiring on 26 April. Mr. Cole will also become a vice-chairman of Unilever N.V., from which position Lord Heyworth is also retiring. **Mr. J. A. Connel,** a director of Unilever and Unilever N.V., will succeed Mr. Cole as vice-chairman of Unilever.

● **Mr. Adrian C. Furse-Roberts** has been appointed treasurer and secretary of Du Pont Company (United Kingdom) as from 1 March. He is succeeded by **Mr. Alec H. Barber,** formerly deputy controller of the company.

● **Major General Sir William A. Scott** has joined the board of Southern Instruments Ltd., Frimley Road, Camberley, Surrey.

● **Mr. A. N. Harrow, A.H-W.C., F.R.I.C.,** chief chemist, Bilsland Brothers Ltd., Glasgow, was re-elected chairman of the Scottish Section, Society for Analytical Chemistry, at the recent annual meeting. **Mr. A. F. Williams, B.Sc., F.R.I.C.,** Research Department of I.C.I. Nobel Division, was re-elected vice-chairman, and **Mr. J. Brooks, M.A., A.R.I.C.,** of the Nobel Division's analytical research station, Stevenston, Ayrshire, was re-elected hon. secretary and treasurer.

Glanvill Benn, chairman of Benn Brothers Ltd., publishers of 'Chemical Age', who has been appointed a director of the Exchange Telegraph Co. Ltd.

● **Mr. T. C. G. Butler** has resigned as managing director of Wm. Butler and Co. (Bristol) Ltd., for reasons of health, after 27 years' service. He has also resigned from the boards of the following subsidiary companies: Bristol and West Tar Distillers Co. Ltd., W. H. Vowles and Sons, Fox and Vowles Ltd., and J. W. Hopkins Ltd.

● **Mr. E. S. Sellers,** formerly Professor of Chemical Engineering at University College, Swansea, has joined British Petroleum Co. Ltd., and will be manager of the Petroleum Division's Sunbury research centre in succession to **Mr. W. M. Catchpole,** whose new appointment has not yet been announced. Mr. Sellers has served with the company previously; in Iran, between 1935 and 1938.

● **Mr. R. G. Mason, B.Sc., A.R.I.C.,** has been appointed a director of A. Boake, Roberts and Co. Ltd., Carpenters Road, Stratford, London E.15. He was ABRAC's chief process development chemist for a number of years before taking up his present post of general works manager. He has been with the company since 1938.

● **Mr. Wm. D. Eaton,** director of finance and secretary of Du Pont de Nemours International S.A., has been promoted to managing director and chairman of the board, from 1 March. He succeeds **Mr. David H. Conklin,** who will concentrate on his expanding responsibilities as European director of the parent company. Mr. Conklin will remain chairman of Du Pont's subsidiary companies in the U.K., the Netherlands, and Belgium. **Mr. George C. Vennum,** deputy director of finance and assistant secretary of Du Pont International, has been appointed to Mr. Eaton's former position. Mr. Eaton continues as assistant European director for finance of the parent company and as a director of Du Pont de Nemours (Nederland) N.V., Du Pont de Nemours (Belgium) S.A., and Du Pont Co. (United Kingdom).

● **Dr. G. V. James, M.B.E., M.Sc., F.R.I.C.,** consulting and analytical chemist, 45 Colston Street, Bristol, was at the recent annual meeting of the Western Section, Society for Analytical Chemistry, elected chairman in succession to **Mr. S. Dixon, M.Sc., F.R.I.C.,** public analyst for Cardiff. **Dr. F. H. Pollard** was elected vice-chairman and **Dr. T. G. Morris, B.Sc., A.R.C.S., D.I.C.,** of the M.R.C Pneumoconiosis Research Unit, Penarth, Glam., was re-elected hon. secretary and treasurer.

● **Mr. Charles N. Freeston** has been appointed group projects engineer for the Frederick Braby group of companies. **Mr. J. F. Nash** has been appointed chief engineer of Auto Diesels Ltd.

● **Major General William M. Creasy,** a vice-president of the Lummus Co., 385 Madison Avenue, New York, and director of the company's engineering development centre, has been appointed manager of the New York division. From 1954 to 1958, when he joined Lummus, he was in charge of the U.S. Army Chemical Corps. **Dr. S. Z. Avedikian,** co-founder of S. Z. Avedikian and Associates in 1959, joins Lummus as acting director of the engineering development centre. The holder of about 30 U.S. and foreign patents, he has been engaged in the research and development of processes and products for more than 25 years. His process for the production of sodium hydrosulphite has just been put into operation by N.V. Koninklijke Nederlandsche Zoutindustrie in Hengelo, Holland.

● **Dr. A. B. D. Cassie, C.B.E., M.A., D.Sc.,** director of the Wool Industries Research Association, is a nominee for election as a vice-president of the Textile Institute. The other nominees are: **Mr. R. G. Oversby,** deputy head of the Department of Textile Industries, Bradford Institute of Technology, and **Mr. M. F. Stevenson, B.Sc.,** managing director of Stevensons (Dyers) Ltd., Ambergate, Derby. Mr. Stevenson is also president-elect of the Society of Dyers and Colourists.

● Following the recent sale of Thorium Ltd. by I.C.I. and Howards and Sons Ltd. to Rio Tinto and Dow Chemie AG, the following have been nominated directors of Thorium Ltd., of Barrington House, 59 Gresham Street, London E.C.2, by Rio Tinto: **Mr. R. W. Wright** (chairman); **Mr. J. R. Poole; Mr. J. R. Robinson.** Nominated by Dow, are **Mr. C. Benson Branch; Mr. R. H. Gregory; Dr. J. D. Head. Mr. M. J. Cahalan,** of Rio Tinto's technical division, has been designated technical supervisor of Thorium Ltd.

R. W. Wright, chairman of Thorium Ltd., is a deputy managing director of Rio Tinto Co. Ltd. He joined the firm as overseas manager in 1952

● **Mr. J. Samuels** has been appointed works director in charge of production for Winston Electronics Ltd., Shepperton, Middlesex. As a member of the board of the company for several years, he has been purchasing director.

● **Mr. M. Arnold Kershaw, F.C.S.,** who is to be installed as president of the Institute of Sewage Purification, at the annual conference in June, is general manager to the West Hertfordshire Main Drainage Authority and not sewage works manager at Rotherham, a position held by his late father, as stated in 'People in the News' on 20 February.

● **Dr. Norman Booth, B.Sc., Ph.D., F.R.I.C.,** who has been appointed chief executive of research and development within the British Oxygen Group, will continue as managing director of British Oxygen Research and Development Ltd.

Commercial News

- **Woodall-Duckham Acquire Ames Crosta**
- **Berk Deny Take-over Rumours**
- **A. & W. Offer for ABRAC Unconditional**
- **Monsanto Net Profit Higher by £677,000**

Ames Crosta Mills

The whole of the issued share capital of Ames Crosta Mills and Co. Ltd., sewage purification engineers of Heywood, Lancs, is to be purchased by Woodall-Duckham Construction Co. Ltd., for the cash sum of £735,000. A. C. Mills, well known in their field, will continue to operate as an independent unit under its present board within the Woodall-Duckham group. Plans are in hand to extend activities of the new subsidiary in the fields of sewage purification and effluent treatment on a world-wide scale.

Anchor Chemical

The Anchor Chemical Co. are raising their ordinary dividend by 2½% to 20% with a 15% final dividend for the year ended 30 November 1959. A one-for-one scrip issue is proposed for shareholders registered on 11 March. Profits increased from £140,413 to £164,362 net from £72,348 to £89,438.

F. W. Berk and Co.

In view of recent press reports, the directors of F. W. Berk and Co. Ltd., state that no offer has been made to them and that no negotiations are in progress for the purchase of the shares of the company.

A. Boake Roberts

The offers made on behalf of Albright and Wilson to acquire the Ordinary and Preference capital of A. Boake Roberts and Co. (Holding) Ltd. have been accepted by holders of 90.83% of the Ordinary and 93.3% of the Preference shares. Both offers have thus become unconditional, and late acceptances will continue to be received.

Boots Pure Drug Co. Ltd.

An interim dividend for the half-year ending 31 Maroh, of 3% is being paid by Boots Pure Drug Co. Ltd. to Ordinary shareholders.

Borax (Holdings)

Group trading profits of Borax (Holdings) for the three months ended 31 December 1959 were higher at £863,868 (£689,838 for the last quarter of 1958).

With the inclusion of other income and after all charges, including £255,503 (£212,722) tax, group net profit for the quarter is £586,679 compared with £475,390.

Imperial Aluminium Co.

The Imperial Aluminium Co. Ltd., an I.C.I. subsidiary, have acquired the ordinary shares of Invicta Foil and Cheswright and Nicholls Ltd., a private company manufacturing aluminium foil.

Power Gas Corporation

New orders received during the first four months of the group's current year by the Power Gas Corporation Ltd. total £9.3 million, states chairman, Mr. W. R. Brown, in his annual report. Contracts completed by the subsidiary P.G. Engineering Ltd., include ammonium sulphate plants in Italy and Germany, a high-pressure oil gasification plant in Belgium, a high-purity hydrogen plant in Germany and plants for production of sulphuric acid and other chemicals in the U.K.

In combination with the group's South African company work continued on a large ammonia plant in South Africa, and although new orders were scarce "work done during the year has already borne fruit in certain orders subsequently obtained. . . . Research and development on the various production processes and on the detoxification of town gas continue to make a very substantial call on our resources."

Monsanto Chemicals

Group net profit of Monsanto Chemicals rose sharply from £1,016,274 to £1,693,266 in 1959 and the dividend is raised from 13½% to 15% with a final of 10%.

The parent company's sales rose from £15,426,633 to a record £18,427,505, and the net income, after tax of £929,211, is up from £657,423 to £1,336,624.

Chairman, Sir Miles Thomas, reports that the improvement in the volume of sales noted in August last, continued during the second half of the year at "even greater momentum". In the result, the value of goods sold during 1959 was substantially higher than the previous best figure of £15,683,272 achieved in 1957. Direct export business accounted for 37% of total sales, a contribution of £6,877,980 to the turnover.

B.A.S.F.

Badische Anilin- und Soda-Fabrik AG, announce a total turnover last year of some DM2,270 million, or about £190 million, higher by 20% than the 1958 figure despite price reductions over the year. Profits for the year, figures of which were not given in last week's statement, were stated to be good, and it is anticipated that the dividend for the past financial year will be higher than the 1958 level of 14%. Investments of B.A.S.F. in 1959 amounted to over DM100 million, or more than £8.35 million. The current year is expected to be a satisfactory one with all major installations working on full stream as in the last half of last year.

NEW COMPANY

THAMES ALUM LTD. Cap. £30,000. To manufacture and deal in aluminium sulphate, alumina, aluminium compounds and alloys, ferrous and non-ferrous metals and chemicals and chemical substances. Subscribers are Alumina Co. Ltd., Iron Bridge Chemical Works, Widnes, Aluminium Sulphate Ltd., 9 Basinghall Street, London E.C.2; Peter Spence and Sons Ltd., 15 Norfolk Street, Manchester 2. A first meeting of directors is scheduled for 8 March.

Market Reports

READY OUTLET FOR NAPHTHALENE

LONDON The call for supplies has been fully maintained with buying interest spread over a wide range of industrial chemicals, whilst the movement on export account continues satisfactory. Some improvement is reported in the demand for fertilisers.

Price movements have been few and generally within narrow limits. The basis prices for white lead, red lead and litharge are unchanged after being 50s to 55s per ton lower, but lower prices are ruling for the zinc oxides, White Seal currently being quoted at £105, Green Seal £103 and Red Seal £100 per ton. Copper sulphate is in moderate request at £83 per ton less 2% f.o.b. Liverpool.

On the coal tar products market supplies of naphthalene continue to find a ready outlet, and both creosote oil and cresylic acid are active sections.

MANCHESTER Industrial users of heavy chemicals, including the textile bleaching, dyeing and finished trades, are maintaining a steady demand for deliveries of the alkalis and most other lines against contracts. Traders on the Manchester market are handling a fair number of additional enquiries. Export movement is satisfactory and covers the usual wide range. Seasonally livelier conditions are reported in fertilisers, including the compounds and the nitrogenous materials.

SCOTLAND The past week has again shown a good volume of business on the Scottish market. Deliveries against spot requirements were well featured together with those for forward demands. Inquiries too have been numerous. The range of chemicals have been varied, particularly those for the textile industries.

Prices have been steady with little alteration. Some difficulty was experienced towards the end of the week with road conditions which have affected transport. The export market remains fairly active and here again inquiries have been numerous.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £128.

Alum. Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18.

Ammonia, Anhydrous. Per lb., 1s 9d-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £33 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £37 10s.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots; crimson, 5s d/d to 5s 5½d; golden, 3s 3½d d/d per lb. to 4s 8½d d/d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 5-ton lots or more, bag packing, £37 10s

Barium Chloride. 2-ton lots, £45.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £39.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech. anhydrous, £70; gran., £47; crystal, £50 10s; powder, £51 10s; extra fine powder, £52 10s; BP, gran., £56; crystal, £59 10s; powder, £60 10s; extra fine powder, £61 10s. Most grades in 6-ply paper bags, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Comm., gran., £78; crystal, £87; powder, £84 10s; extra fine powder, £86 10s; BP gran., £91; crystal, £99; powder, £96 10s; extra fine powder, £98 10s. Most grades in 6-ply paper bags, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack; solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17 cwt. drums d/d in 3-drum lots, £41.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. In kegs, 1-4 cwt. lots, per cwt. £9 18s 6d; 5 cwt. lots, up per cwt., £9 15s; packed in paper bags, 5 cwt. lots, up, per cwt., £9 8s 6d.; 1-4 cwt. lots, per cwt., £9 13s 6d.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 2s 1d.

Copper Sulphate. £83 per ton less 2% f.o.b. Liverpool.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £40.

Formic Acid. 85%, in 4-ton lots, c.p., £91.

Glycerine. Chem. pure, double distilled 1.2627 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £12 1s 6d. Refined technical grade industrial, 5s per cwt less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 1s 2d.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £119 0s 0d; 35% wt., d/d, £143.

Iodine. Resublimed BP, under 1 cwt., per lb., 11s; for 1-cwt. lots, per lb., 10s 6d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc. Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Iodoform. Under 1 cwt., per lb., £1 2s 4d for 1-cwt. lots, per lb., £1 1s 8d, 5 cwt., per lb., 21s 1d, crystals, 3s more.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basic prices: 15-cwt. drum lots, Genuine dry red, £108 10s per ton; orange lead, £120 10s per ton; Ground in oil: red, £128 15s, orange, £140 15s.

Lead, White. Basic prices: in 5-cwt. drums, per ton for 2 ton lots, Dry English £120; Ground in oil, £139.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-cwt. drum lots, £110 10s per ton.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 1-ton lots, £1 1s; 5-cwt. lots, in 28-lb. parcels, £1 1s 3d; 1-cwt. lots, £1 1s 6d.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s 6d; 1-cwt. lots, £1 11s.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35 2s.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 56 lb. paper bags, c.p., about £130.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb., 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £76.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 7s; per lb. for 1-cwt. lots, 6s 10d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 11¼d; 5-cwt. lots, per lb., 1s 10¾d; 1-ton lots, per lb., 1s 10½d; 5-ton lots, per lb., 1s 10d. Tech., 1-ton lots in 1-cwt. drums, per cwt., £9 18s; 5-cwt. in 1-cwt. drums, per cwt., £10; 1-cwt. lots, £10 9s.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 6d, cwt. lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £16 11s 6d.

Sodium Acetate. Comm. crystals, d/d, £75 8s.

Soda, Caustic. Solid 76/77%; spot, d/d 1-ton lots, £33 16s 6d.

Sodium Bicarbonate. Ton lot, in non-ret. pack, £12 10s.

Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £64.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £80 per ton.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £126.

Sodium Dichromate. Gran. Crystals per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1½d. Net del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 56 lb. per lb., 10s; 56 lb. and over, 9s 9d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1-ton lots, 1-cwt. free paper bags, £29.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., per ton, £29.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10% available oxygen) in 1-cwt. free kegs, 1-ton lots, £129 10s; in 1-cwt. lots, £139 5s.

Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 6-ton lots, d/d station in loaned drums, £12 10s; Dorset, Somerset and Devon, per ton extra, £3 5s; Scotland and S. Wales, extra, £2 17s 6d. Elsewhere in England, not Cornwall, extra, £1.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £19.

Sodium Sulphate [Glauber's Salt]. D/d, up to £14.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £9 15s. per ton. £11 7s 6d; 140° Tw., arsenic free, £8 2s 6d; 140° Tw., arsenious, £7 17s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, in kegs, 300s; in bags, 292s per cwt.

Titanium Oxide. Standard grade comm., rutile structure, £178; standard grade comm., anatase structure, £163.

Zinc Oxide. Per ton: white seal, £105, green seal, £103; red seal, £100.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128; in 10-gal. drums, £118; in 40-45 gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £165.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £137 10s.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons

£130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.

Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400-gal. tank wagons, £142.

Dibutyl Phthalate. In drums, 10 tons, d/d per ton, £203; 45-gal. 1-4 drums, £209.

Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. 1-4 drums, £193 10s.

Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179; 45-gal. 1-4 drums, £185.

Dioctyl Phthalate. In drums, 10 tons, d/d, per ton, £276; 45-gal. 1-4 drums, £282.

Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.

Ethyl Acetate. 10-ton lots, d/d, £137.

Ethyl Alcohol Fermentation grade (PBF 66 o.p.). Over 300,000 p. gal., 3s 10½d; d/d in tankers, 2,500- 10,000 p. gal. per p. gal., 4s 0½d. D/d in 40/45-gal. drums, p.p.g. extra, 2d.
Absolute alcohol (74.5 o.p.), p.p.g. extra, 2d.

Methanol. Pure synthetic, d/d, £40.

Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 7½d; 100-499 gal. in drums, d/d per gal., 6s 0½d-6s 2½d. Pyridinised 66° o.p.: 500 gal. and up, in tankers, d/d, per gal., 5s 11d; 100-499 gal. in drums, d/d, per gal., 6s 4d-6s 6d.

Methyl Ethyl Ketone. All d/d. in 40/45-gal. drums, under 1 ton, £143 10s; 1-5 tons, £138 10s; 5-10 tons, £136 10s; 10 tons and up, £143; in 400-gal. tank wagons, £134 10s.

Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203; in 10-gal. drums, £193; 40-45 gal. drums, less than 1 ton, £168; 1-9 tons, £165; 10 tons and over, £163; in 400-gal. tank wagons, £160.

Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.

***iso*Propyl Acetate.** 10 tons, d/d, 45-gal. drums £132.

***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45-gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.

Carbon Black. GPF: Ex-store, Swansea. Min. 3-ton lots, one delivery, 7¼d per lb.; min. 1-ton lots and up to 3-tons, one delivery, 7¾d per lb.; ex-store, Manchester, London and Glasgow, 8¼d per lb. HAF: ex-store, Swansea; Min. 3-ton lots, one delivery, 8d per lb.; min. 1-ton lots and up to 3-tons, one delivery, 8¼d per lb. Ex-store Manchester, London and Glasgow, 9d per lb.

Carbon Tetrachloride. Ton lots, £83 15s.

India-Rubber Substitutes. White, per lb., 1s 4½d to 1s 7d; dark, d/d, per lb., 1s 0½d to 1s 4d.

Lithopone. 30%, about £57 10s for 5-ton lots.

Mineral Black. £7 10s-£10.

Sulphur Chloride. British, about £50.

Vegetable Lamp Black. 2-ton lots, £64 8s.

Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.

Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4¾d; 40/50-gal. ret. drums extra, per lb., ¼d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 5d.

Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.

Cresylic Acid. Pale 99/100%, per gal., 7s 4d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, 8s; per US gallon, c.i.f. NY, 103.50 cents freight equalised.

Naphtha. Solvent, 90/160°, per gal., 5s 3d. heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.

Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £22-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£68.

Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.

Pyridine. 90/160, per gal., 16s 6d about.

Toluol. Pure, per gal., 5s 9d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s 1d.
MANCHESTER: Pure, naked, per gal., 5s 6d.

Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 5s 9d-5s 11d.

INTERMEDIATES AND DYES

(Prices Normal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.

o-**Cresol** 30/31°C. D/d, per lb., 1s.

p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.

Dichloraniline. Per lb., 4s 6d.

Dinitrobenzene. 88/99°C., per lb., 2s 1d.

Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.

p-**Nitraniline.** Per lb., 5s 1d.

Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots, d/d, per lb., 10d.

Nitronaphthalene. Per lb., 2s 5½d.

o-**Toluidine.** 8-10 cwt. drums (drums extra), per lb., 1s 11d.

p-**Toluidine.** In casks, per lb., 6s 1d.

Dimethylaniline. Drums extra, c.p., per lb., 3s 2d.

Approved List of Crop Protection Products

IN 1942, the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland started the voluntary scheme for the official approval of insecticides, fungicides and weedkillers marketed in Great Britain under proprietary brand names. The main object of the scheme is to give guidance to the grower in the purchase of crop protection materials and approval is granted in respect of products which comply with standards of composition and performance approved by the Ministry and the Department for the purpose given on containers.

The Ministry have now released the approved list for 1959-60 (*Crop Protection Products Approval Scheme: Approved List 1959-60*. Copies of this can be obtained free from the Ministry of Agriculture, Fisheries and Food (Publications), Soho Square, London W.1.

TRADE NOTES

Synthetic-flooring Polishes

Wax technical service bulletin No. 64, available from Bush Beach and Segner Bayley Ltd., Marlow House, Lloyd's Avenue, London, E.C.3, describes basic formulations of paste polishes which are solvent free and can "safely be used on all types of synthetic floorings." It also deals with Abril Wax E, said to be suitable for pharmaceutical and cosmetic trades as a substitute for bleached beeswax; and Abril Wax 10DS, having a chemical attraction for most metal surfaces, a solid, high-pressure lubricant for the prevention of 'fretting' and corrosion.

Benzole Specifications

A booklet is available describing standard specifications for benzole and allied products 1960, published by the National Benzole and Allied Products Association, 132 Sloane Street, London, S.W.1. The publication includes standard specifications for benzenes, toluenes, xylenes, and coal tar napthas, as well as methods of test recommended for these products.

Tape Sealing Medium

A leaflet describing Threadseal tape, a new product for jointing pipelines, is available from the manufacturers, Crane Packing Ltd., of Slough, Bucks. The tape, said to be equally suitable for corrosive chemicals and fuels as for water, is manufactured from p.t.f.e. and supplied in spools of 480 in. by ½ in. width. It can be used to seal against pressures of "many thousands of p.s.i." and temperatures of minus 200°F to plus 500°F. Caustics, hydraulic fuels and aromatic fuels are also mentioned among fluids to which the tape is resistant.

Viton Synthetic Rubber

A new version of Viton synthetic rubber said to have doubled that product's useful life at temperatures from 500 to 600°F in certain strong chemicals, is available from Du Pont Co. (U.K.) Ltd., 76 Jermyn Street, London W.1. It can be used in moulded goods and coated fabrics and is claimed resistant to special lubricants and hydraulic fluids used in missiles and high-speed aircraft. It is expected further to broaden usage of the versatile fluorine-containing elastomers.

New Calgon Descaler

Albright and Wilson (Mfg.) Ltd., 1 Knightsbridge Green, London S.W.1, are to manufacture a new descaler designed for smaller industrial applications, to be marketed under the name Calgon descaler. It is an inhibited acid powder said to be easily handled and used with safety to remove scale from cooling towers, coils and jackets, once-through and closed systems, condensers and small boiler and heat exchangers.

Rozalex Skin Cleansers

Among the new products available from Rozalex Ltd., 10 Norfolk Street, Manchester 2, are industrial skin cleansers of two types, suitable for use with and without water and aimed to reduce occupational dermatitis.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 6 April

Manufactture of copolymers. Farbwerke Hoechst AG. **832 207**

Ethylation of toluene. Mid-Century Corp. **832 208**

Thermoplastic materials. Telegraph Construction & Maintenance Co. Ltd. **832 065**

Absorption apparatus including bubble-trays. Didier-Werke AG. **832 211**

Preparation of chemically reactive allyl-cellulose. Regie Nationale Des Usines Renault. **831 969**

Synthesis of carboxylic acids from olefinic compounds, carbon monoxide and water. Montecatini Soc. **832 212**

Method of and apparatus for the manufacture of phosphoric acid. Union Chimique Belge, S.A., and Manufactures Des Glaces Et Produits Chimiques De Saint-Gobain, Chauny Et Cirey S.A. Des. **831 970**

Production of gases containing sulphur dioxide by simultaneous combustion of sulphur and hydrogen sulphide and for the production of sulphur trioxide and sulphuric acid therefrom. Chemiebau, Dr. A. Zieren GmbH. **832 215**

Waste compositions and self-gloss emulsions produced therefrom. Ruhrchemie AG. **832 220**

Peptides and derivatives thereof, and process for their manufacture. Ciba Ltd. **831 973**

Organosilicon compositions. Midland Silicones Ltd. **832 224**

Olefin polymerisation. Esso Research & Engineering Co. **832 225**

Halogenated bicyclo-[2:2:1]-heptenes and a process for their manufacture. Farbwerke Hoechst AG. **832 226**

Hydroperoxides of synthetic high molecular weight polymers and process for their preparation. Montecatini Soc. **832 068**

Method and apparatus for controlling catalytic processes. Phillips Petroleum Co. **831 979**

Heterocyclic dithiophosphate compounds. Hercules Powder Co. [Addition to 785 990.] **832 230**

Process for the production of polyamides. Leuna-Werke W. Ulbricht Veb. **831 981**

Process and equipment for obtaining mineral and chemical products by means of hydro-metallurgy. Moreno, F. L. **83 072**

Brightening agents comprising axylpyrazolines. Farbenfabrik Bayer AG. **832 239**

Salts of amine acetates. Geigy AG., J. R. **832 361**

Desulphurisation of coke oven gases. Bergwerksverband GmbH., formerly Bergsverkverband Zur Verwertung Von Schutzreckten Der Kohlentechnik GmbH. **832 075**

Dry preparations capable of yielding cation-active melamine resin solutions by dissolution in water and ripening and process for their manufacture. Ciba Ltd. **831 986**

Preparation of adrenocorticotrophin. Armour & Co. **832 241**

Production of unsaturated, tertiary amines. Geigy AG., J. R. **832 078**

Process for unsaturated polyester resins. Deutsche Gold- und Silberscheideanstalt Vorm. Roessler. **831 987**

Steroid compounds. Laboratoires Francais De Chimiotherapie. **832 244**

Process and apparatus for discharging solid particles. Imperial Chemical Industries Ltd. **832 246**

Thioxanthones. Ciba Ltd. **832 079**

Manufacture of N-acylamino compounds. Ciba Ltd. **832 080**

Process and catalyst for polymerisation of polymerisable hydrocarbons. Phillips Petroleum Co. **832 083**

Preparation of trans-2, 5-dimethylpiperazine. Union Carbide Corp. **831 872**

Copolymers of ethylene-propylene. Esso Research & Engineering Co. **831 989**

Diquaternary compounds. Wellcome Foundation Ltd. **832 250**

Measurement of gas entrained in liquids and of vapour pressure. National Research Development Corp. **832 085**

Continuous polycondensation process of dimethyl terephthalate with ethylene glycol. Vereinigte Glanzstoff-Fabriken AG. **832 088**

Manufacture of photographic materials. Imperial Chemical Industries Ltd. [Addition to 793 554.] **832 091**

Polymers and process and catalyst for production thereof. Phillips Petroleum Co. **831 994**

Coating compositions and coated films. Du Pont De Nemours & Co., E. I. **831 995**

Production of 2:2-bis (oxyaryl) propane compounds. Union Carbide Corp. **831 996**

Production of high molecular weight calcium complex compounds. Geigy AG., J. R. **832 093**

Anthraquinone vat dyestuffs and process for their manufacture. Ciba Ltd. **831 880**

Water-soluble copolymers derived from acrylamide, methacrylamide and acrylic acid esters. Badische Anilin- & Soda-Fabrik AG. **831 881**

Manufacture of boron halides. Olin Mathieson Chemical Corp. **832 096**

Hydrocarbons. Imperial Chemical Industries Ltd. **831 883**

Aluminium phosphate dispersion. American Cyanamid Co. **832 374**

Substituted nitroquinolones. Imperial Chemical Industries Ltd. **831 885**

Production of pure silicon. Standard Telephones & Cables Ltd. **832 334**

Oxidation of anthracene to anthraquinone. Ciba Ltd. **831 889**

Preparing gas mixtures containing hydrogen and carbon monoxide. Bataafsche Petroleum Maatschappij N.V., De. [Addition to 780 120.] **832 385**

Preparing alkylated and aralkylated phenolic condensation products. Goodrich Co., B. F. **831 828**

Steroid compounds. Laboratoires Francais De Chimiotherapie. [Addition to 832 244.] **832 245**

Manufacture of mercaptans. Imperial Chemical Industries Ltd. **832 002**

Steric inversion of allothreonine and intermediates of inversion. Takeda Pharmaceutical Industries Ltd. **832 003**

Antibiotic designated compound number 616. Pfizer & Co. Inc., C. **832 391**

Irradiated olefin polymers. Phillips Petroleum Co. **831 896**

Activating phosphate dehydration catalysts, and a phosphate dehydration catalyst. Lonza Electric & Chemical Works Ltd. **831 831**

Production of water-soluble copolymers. Badische Anilin- & Soda-Fabrik AG. **831 832**

Antacid preparation and process for making same. Bristol-Myers Co. **831 897**

Stable butyl rubber latices. Esso Research & Engineering Co. **831 833**

Recovery of a vaporisable hydrocarbon from liquid mixtures. Phillips Petroleum Co. **832 009**

Compositions comprising a thermoplastic copolymer and a thermosetting aminoplast resin. Rohm & Haas Co. **831 898**

Manufacture of refractory ceramic materials. General Electric Co. Ltd. **831 835**

Rosin modified unsaturated alkyds and copolymers thereof. United States Rubber Co. **832 010**

Polymerisation of ethylene. Soc. Des Usines Chimiques Rhone-Poulenc. **831 899**

Granular potassium metaphosphate. Scottish Agricultural Industries Ltd. **832 011**

Hydroxypropylation of hydroxy compounds. Dow Chemical Co. **831 900**

Esters of hyponitrous acid and their preparation Imperial Chemical Industries Ltd. [Addition to 813 460.] **831 837**

Manufacture of olefin polymers. Sun Oil Co. **831 838**

Manufacture of polyene compounds. Hoffmann-La Roche & Co., AG., F. **831 901**

Polymerisation of 3, 3-disubstituted oxetane. Hercules Powder Co. **832 283**

Production of terephthalic acid. Imperial Chemical Industries Ltd. **831 902**

Oxidation of organic compounds. Imperial Chemical Industries Ltd. **832 012**

Preparation of crystalline dihydrostreptomycin sulphate. Distillers Co. Ltd. **831 904**

Wet production of a uranium double-fluoride. C.I.S.E., Centro Informazioni Studi Esperienze S.R.L. **831 905**

Corrosion-inhibiting imidazolines. Esso Standard Soc. Anon. Francaise. **832 015**

Monoazo dyestuffs containing amidino groups. Farbenfabriken Bayer AG. **832 285**

Production of 1-olefins. Phillips Petroleum Co. **831 910**

Coating compositions. Du Pont De Nemours & Co., E. I. **832 111**

Producing substituted alkylamines and acid-addition salts thereof. Philips' Gloeilampenfabrieken N.V. **832 286, 832 287, 832 288 & 832 289**

Polymerisation of N-vinylcarbazole. British Oxygen Co. Ltd. [Cognate application 39 579.] **831 913**

Steroid process. Pfizer & Co. Inc., C. **832 116**

Purification of isophorone. Distillers Co. Ltd. **832 124**

Stabilised hydrocarbon polymeric materials. Western Electric Co. Inc. **832 024**

Monoazo dyestuffs containing sulphonic acid-(sulphonyl)-amide groups. Farbenfabriken Bayer AG. **831 840**

Novel catalysts, process for the manufacture thereof and use thereof in a racemisation process. Roche Products Ltd. [Cognate application No. 37 249.] **832 025**

Irradiated resins. Esso Research & Engineering Co. **831 842**

Production of styrene and related compounds. Purvin & Gertz Inc. **832 027**

Monoazo dyestuffs of the benzene-azo-naphthalene series and their use. Geigy AG., J. R. **831 843**

Production of alkali metal salts of homocysteine and homocysteine thiolactone acid addition salts. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **831 844**

1 β-carboxy-5-β-hydroxy-8-ketohexahydronaphthalene lactone. Laboratoires Francais De Chimiotherapie. **832 292**

Concentrating urea solutions. Stamicarbon N.V. **832 293**

Platinum group metal catalysts. Norton Grinding Wheel Co. Ltd. **832 031**

Production of actinomycins F_1 and F_3 by fermentation. Farbenfabriken Bayer AG. **832 032**

Process and catalyst for the dehydrogenation of hydrocarbons. Bataafsche Petroleum Maatschappij N.V., De. **832 297**

Process for coating substrates. Goodrich Co., B.F., **831 846**

Lubricants containing polybutane-1". Esso Research & Engineering Co. **831 847**

Production of nicotinamide. Abbott Laboratories. **831 848**

Process of preparing a cortin-like product. Laboratoires Laroche Navarron. **831 849**

Silicone adhesives. Farbenfabriken Bayer AG. **832 037**

Imidazoline corrosion inhibitors. Commercial Solvents Corp. **832 038**

Leucauramine derivatives. Caribonum Ltd. [Cognate application 6 765.] **831 852**

Glycoluril derivatives. Diamond Alkali Co. **831 853**

Concentration of rock phosphate. Negev Phosphates Ltd. **831 916**

Apparatus for the continuous calendering of synthetic material. Montecatini Soc. **831 917**

Preparing poly-hydroxyaryl phenones. General Aniline & Film Corp. **832 043**

Extracting tartaric acid and potassium as pure nitrate from tartaric materials. Montecatini Soc. **831 918**

Preparation of polymeric compositions. Koppers Co. Inc. **832 303**

Sulphonamide compounds and preparation thereof. Sterling Drug Inc. **831 919**

Phenthiazine derivatives and processes for their preparation. Soc. Des Usines Chimiques Rhone-Poulenc. **831 920**

Granulation method. U.S. Atomic Energy Commission. **832 309**

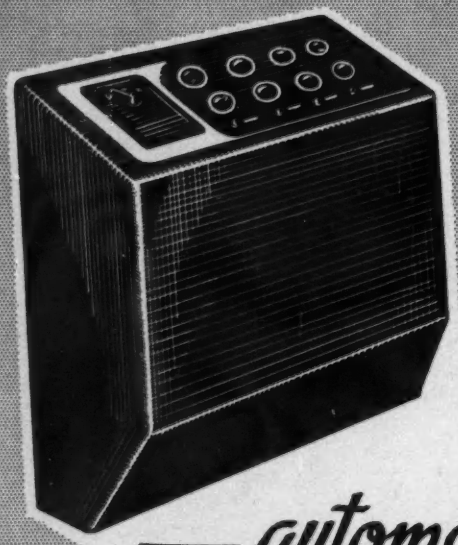
Preparation of precipitated calcium carbonate. Solvay Ee Cie. **831 921**

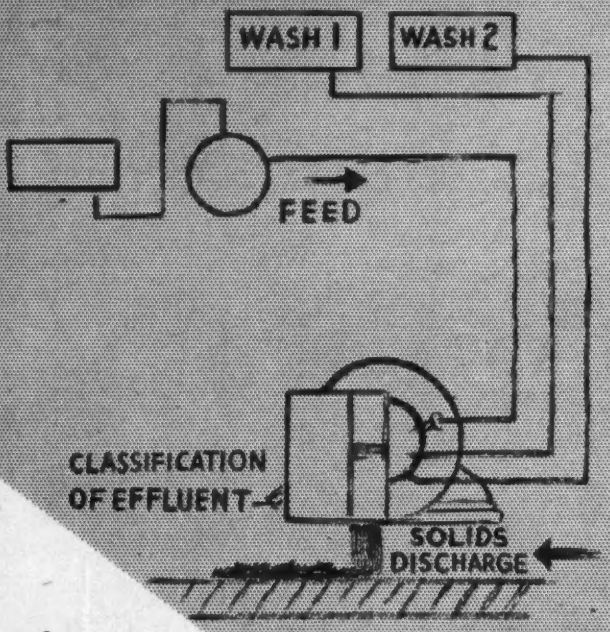
Production of boron hydrides. Du Pont De Nemours & Co., E.I. **832 049, 832 133 & 832 134**

Production of fine-pore-metal filters, membranes and diaphragms. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **832 317**

Production of finely divided metal powders by thermal decomposition of metal carbonyls. Deutsche Gold- Und Silber-Sheideanstalt Vorm. Roessler. **832 318**

Polymerisation of vinyl-type monomers. Du Pont De Nemours & Co., E. I. **832 319**





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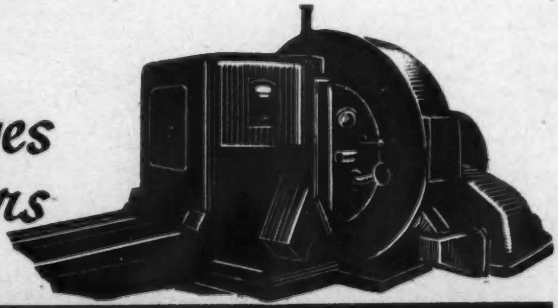

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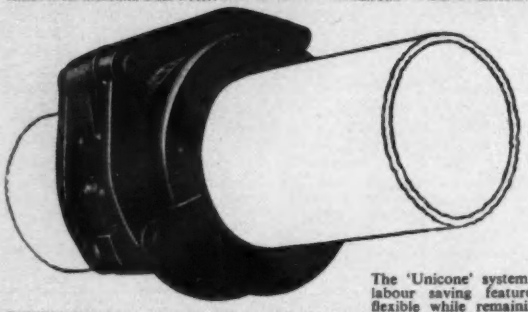

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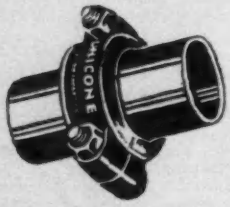

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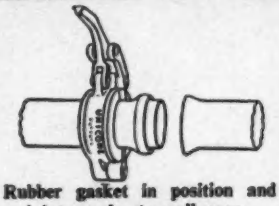
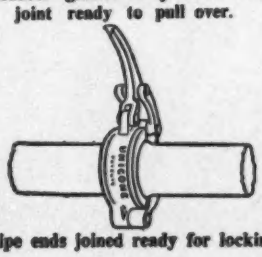


Rubber gasket in position and joint ready to pull over.



Pipe ends joined ready for locking.

The completed joint.

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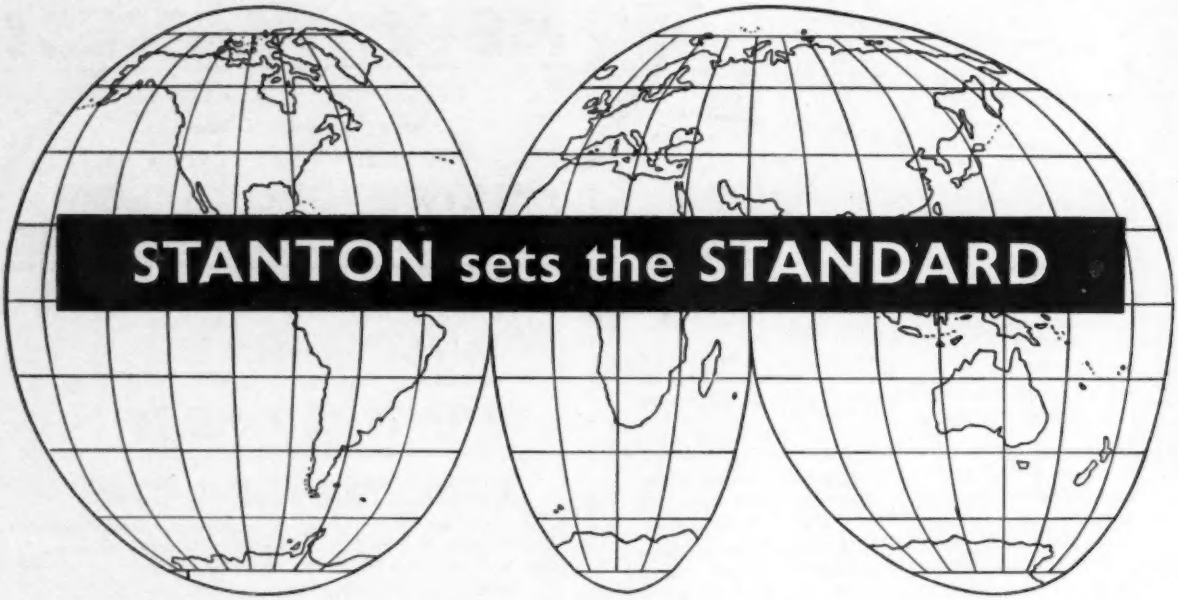

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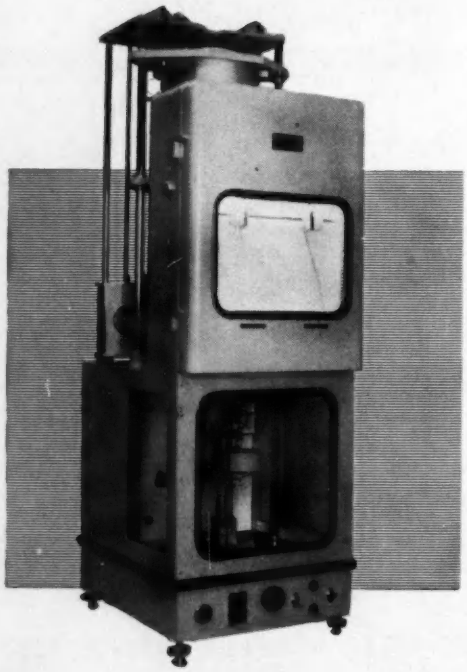

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